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A Brief Review of Flue Gas Treatment

Owing to the ever increasing activity of the various State and municipal boards of health, and of the smoke farmer who regards the smoke maker as his legitimate prey, the treatment of flue gases and combustion products is of interest to practically every manufacturing and metallurgical works. For the prevention of dust and fume, the plan that first occurs to everyone is that of the settling flue. The simplest form of this consists in a long flue and a tall stack. While it was formerly the custom to place various baffles in these flues, this seems of doubtful utility, as the stirring up which the gas gets seems to hinder the settlement of the solid particles rather than to aid it. It is of interest in this connection to recall that the Omaha & Grant smeltery at Denver, Colo., which was reputed to have rather over half a mile of flues, at the end of which was one of the tall chimneys of the United States, somewhat over 300 ft. high, constantly discharged a stream of white fume. In view of this, any system of flues, however long, must be considered of doubtful advantage.

If a flue must be used, it seems that the efficiency can be greatly increased either by a system of vertical wires such as has just been installed at the Boston & Montana smeltery, or by a system of longitudinal plates, the gas, in flowing over the surface of these plates, depositing a large portion of the dust and fume. For reverberatory furnaces and kindred pieces of metallurgical apparatus, the waste-heat boiler is not only a convenient method of recovering a portion of the otherwise lost heat but is in itself an efficient dust collector.

It has been shown by experiment at the Copper Queen smeltery that more effective settling is gained by expanding the flue into a large chamber. If the velocity of the gas drops below about 2½ ft. per sec., it seems that all of the true dust is deposited in 50 sec., but true fume will not deposit, no matter how long the gas flows through such a chamber.

In order to assist deposition of the dust, and at the same time to discharge the effluent gas sufficiently high above the ground to be unnoticeable, the flue is often run up a hillside, but unless the flue be of large cross-section, it is doubtful whether its inclination greatly facilitates settling.

Of assistance in dealing with flue dust in long flues, and to a certain extent with fume also, is the system of water sprays and of cooling pans. Probably the most effective water sprays are those on the principle of the Koerting nozzle, in which all of the water is vaporized. The small particles of dust and fume in the gases act as centers for the recondensation of the water vapor, resulting in what is practically a small rain storm, which carries down a great deal of the dust and fumes.

It is possible with a small flue to make a roof out of cooling pans. The flue should gradually either increase in hight, or run slightly up hill, as it runs away from the furnaces, and the pans can be used stepwise to form the entire roof. Water flows from one pan into the next below it, the flow into the upper pan being regulated so that there is either little or no overflow from the lowermost pan, but so that some water is always there, thus securing the maximum efficiency for the water used.

Where the baghouse can be used, this is probably the most effective method of treating flue gases, being far superior to coke towers, etc. Unfortunately this is not universal in its application, for gases high in sulphur trioxide, such for instance as those from roasting furnaces, will eat away the bags rapidly. Selenium and its compounds are also exceedingly destructive to bags, owing to the fact that all of the oxides of selenium are subject to reduction by organic matter. Tellurium seems to be only slightly active.

The applicability of the baghouse, however, has been greatly extended by the invention of C. B. Sprague; the basic principle of this is the introduction of zinc oxide, or some other base, into the gases, thus neutralizing the acids which may be present. The life of the bags with this system seems to be almost indefinite. The working of a baghouse with both lead and copper furnaces is somewhat complicated by the high temperature of the gases. In the copper smeltery the danger is only the burning of the bags. In the lead plant, not only are the bags combustible, but the lead fume is itself of a low kindling point and somewhat explosive in its properties.

The only thing to be done in this case is to reduce the temperature of the gases by radiation, conduction, or dilution with air, as the use of the water sprays results in a mush which soon clogs the bag.

The centrifugal scrubber finds a large use in the metallurgy of steel and is to be found described in any of the text books on that subject. There are other forms of scrubbers dependent upon bubbling the gases through various solutions, sometimes alkaline in case the gas is acid, or they may be simply oily, as various oils have apparently a greater power of condensing fumes than have aqueous solutions. These scrubbers are in general of two types, those in which there is a large chamber into which the gas is first received, from which a number of tubes run down into the solution, which results in splitting up the stream of gas into a great number of smaller streams. Even then the bubbles of gas are so large with this apparatus that the scrubbing action is not very efficient.

Another form of apparatus consists in a large circular perforated plate, sloping downward toward the edges and pierced with a multiplicity of small holes. This results in an effective distribution of the gas into small bubbles, but if the gas be highly charged with solid particles, the holes soon clog. It is extremely effective for the removal of soluble substances.

Finally to be considered is the Cottrell system of electrolytic condensation, described recently in the JOURNAL, which depends on the agglomeration of floating particles by high-potential charges.

The Wislicenus lattice-work stack, in which the upper portion is pierced with a multiplicity of holes, is a dilutor only, resulting in the presence of obnoxious substances often being rendered unnoticeable, but it performs no elimination.

The German Pig Iron Syndicate

An important incident in the German iron industry is the reconstruction of the Pig Iron Syndicate, after long discussion. The new organization is on much stricter lines than those of the old syndicate, which lapsed about a year ago. The syndicate will have absolute control of all sales and distribution of pig iron, and all shipments will be made under its direction. The shipments will be made from furnace to consumer in such a way as to keep down transportation costs to the lowest possible figure. Moreover, it is announced that the syndicate will regulate prices with the purpose of keeping out foreign iron as far as possible; also that it will push export trade in every possible way.

The new syndicate includes practically all of the German blast furnaces except those of the Luxemburg minette ore district. But the ironmasters of that district have agreed to act with the syndicate for one year, their adhesion beyond that time depending upon results.

In case iron is sold at a loss, either to shut out imports or to promote exports, the loss will not fall upon the furnaces furnishing the iron, but will be distributed over the whole production. This is by far the closest syndicate agreement yet effected in German trade, which has several other similar agreements, and its result will be watched with interest.

The Foreign Tinplate Trade

The foreign trade statistics for the current year have shown a remarkable change in one line of iron and steel. Tinplates heretofore have—notwithstanding the growth of the manufacture in this country from year to year—been one of the larger items of imports, the Welsh makers having always succeeded in keeping a certain hold upon our trade. In the nine months ended Sept. 30, however, the imports of tinplates fell from 53,803 tons in 1910 to 12,854 tons this year. The former figure was not far from the average of several previous years, while the total for 1911 was the smallest on record. The explanation of this notable change is found in the fact that American makers have this year succeeded in capturing what is known as the drawback trade; that is, the supply of tinplate for cans for oil and for provisions, on which a drawback is allowed by the tariff when they are exported, which practically offsets the duty. For years this trade has been held for the most part by the Welsh mills, but it has passed from them under the influence of the lower prices prevailing; perhaps also through certain concessions not generally known to the trade.

On the other hand, the exports of tinplates in the nine months rose from 8395 tons in 1910 to 42,557 tons this year. This seems to be a direct capture of foreign trade, and has been effected mainly by the export branch of the Steel Corporation. The trade must have been secured by a sharp cutting of the Welsh makers' prices.

It is, perhaps, not generally known that the Welsh trade is now largely supplied with steel in the form of billets and tinplate bars by Pittsburg mills. To what an extent this is done is shown by the fact that imports of steel in that form have risen from 14,162 tons in nine months of 1910 to 181,178 tons this year.

A growing conviction that prices of iron and steel have nearly or quite touched bottom seems to be moving buyers. Until a week or so ago the buying movement was to some extent uncertain and rather superficial, though large in volume. Now a movement has set in which is stronger, since it begins at the bottom, in pig iron. Both foundry and basic irons are being freely taken, and to a greater extent than has been the case for nearly two years past. Moreover, another change is apparent, in that buyers are evidently looking ahead and taking longer deliveries and larger contracts. All of which is encouraging to the trade, and a sign of better consumption and better business.

Whatever may be the American copper statistics that will be made public after we have gone to press, the European statistics with their reduction of 12,544,000 lb. in November have made a good showing, and amply illustrate the strength of the demand for copper abroad that induced the sharp upward movement in the market.

By the Way

Shakespeare remarked something about showing others the steep and thorny way to heaven. According to a Carthage, Mo., despatch, L. P. Cunningham, although he made a fortune in Joplin mines, willed that if any of his beneficiaries invested their bequests in mining property they should forfeit their right to participate in the estate, which is valued at $500,000. This seems very much like treading the primrose path of dalliance and recking not his own rede.

It is reported from Joplin that the zinc-ore producers of that district have determined to build a smelting works of their own. It will have capacity for smelting 25,000 tons of ore per annum. Its main purpose will be "to maintain the rightful relation between ore and spelter." If it does not do that, it will at least afford experience. Inasmuch, however, as a smeltery of the proposed size costs a good deal of money, we recommend to its promoters that they finance it adequately before they begin construction, that they secure the best engineering assistance that money can buy, and finally that they retain an accomplished business manager, even if they have to pay him a very fat salary.

As a result of the war in China, 14 Chinese indemnity students at the Colorado School of Mines have had their remittances from Washington stopped on account of the discontinuance and possible abolishment of the fund out of which their expenses have been paid. Our correspondent writes: "They are all bright ambitious men and it is hoped that the local Chinese colony, or some wealthy mining man, will help them in their predicament." If worst comes to worst, it might be suggested that the ancient and honorable occupation of mucking has improved the digestion and increased the practical knowledge of many American engineers. With a good partner, an adequate command of classic English can usually be acquired in a few days.

Telling of boundless wealth, illness, privation and hope abandoned in the heart of the Alaskan wilds, a message signed "Frank Wilson," was found tied to the leg of a wild goose killed recently by a Granite City, Ill., sportsman. The message read: "July 16, 1910,—250 miles due north of White Horse rapids, on Pine creek. Ill since June 15. Feel certain I am going to die. Right arm broken above elbow in falling from side of mountain. Can hardly walk. Flour in cabin, no way of cooking it because of my condition. Two hundred yards up the gulch is a body of almost solid gold—not nuggets, but a solid sheet or vein. It will never do me any good. Winter is near. I will freeze to death. There is no hope for me.. I can hardly move in my bed. I came from Memphis, Tenn. My last move before I die will be to call to my side a young goose of wild breed, which I have raised from a gosling. I will tie this message around its neck. When I am dead it will become wild again and fly away." This story is indeed touching, and were it not one of our hardiest perennials, might start a new rush to Alaska. Those who don't go immediately, however, will be on hand for staking in the goldfield annually presaged by the finding of nuggets in the gizzards of chickens.

The Department of Justice is said to be about to move against the Aluminum Company of America, charging, among other things, that it is a monopoly, and a stifler of competition in the aluminum business. Under the latter head it is "charged with the absorption of the Pittsburgh Reduction Company, a competitor, and the making of agreements to control the price for the metal. The Aluminum Company began as the Pittsburgh Reduction Company and acquired its present name by a reorganization. Rhetoricians may argue as to whether it absorbed or succeeded the Pittsburgh Reduction Company. Certainly it did not drive a competitor out of business, nor did it enter into any agreement with anybody to control prices, there being no other producer in this country, nor ever having been. To tell the bald truth, the Aluminum Company is a monopoly. It became such by virtue of patent rights, but since the expiration of its basic patents no one has seen fit to enter into competition with it, though anyone commanding the requisite capital has been free to do so. Continuing in our adherence to the truth, the Aluminum Company has in recent years established its price for the ingot metal at a little under the European price plus an absurd tariff protection that an enlightened Congress saw fit to give it. Consequently, the Department of Justice flies in the face of the will of the people expressed through their presumably intelligent representatives in Congress. Of course, if the people did not want to pay what the Aluminum Company demands they would immediately abolish the tariff of 7c. per lb. In spite of the latter a little foreign aluminum creeps in from time to time, and if the Aluminum Company should become exorbitant any hungry consumer can contract for foreign ingot, by telephone in about one minute, with the New York agents of eager sellers in Europe, where there is an almost chronic state of overproduction. If the Department of Justice is silly enough to prosecute this case, the courts may eventually pass upon the interesting questions pertaining to a monopoly that never had a competitor and what is to be done to a monopoly charging prices in accordance with a right conferred by act of Congress.

We have all met men who thought they had most of the mineral wealth of the country corralled in their claims but that may have been before radium, uranium and the other rare-metal ores had been proved valuable, so that the present-day type has some new furbelows. The following letter sent recently to a metallurgical firm is what might be called an uptodate classic of this sort:

————, Nov. 11, 1911

Gentlemen:

Yours of the 1st to hand. I am away from home working on my wife's rare mineral quartz lode which carries Au, Ag, Pb, Cu, Te, Bi, Sb, Mo, V, U, C, Fe, Ba, S, Hg, Ra and other things usual in association.

My placer mine carries Au, Ta, Ti, Sn, Ca, Sr (Celestite), Pt, Pd, Zr, and Zr gems, Hyacinth and Jargon Native Telurium, Nagyagite, Corundum ruby, Spinel ruby, Emeralds, and quantity of corundum and garnet for abrasives.

I have Monazite in greater quantity than Brazil or the Carolinas. I have Thorite, Orangite, native Bi, and other things I will not now mention.

I have 6276 electric power and ditch made. I am incorporated in Arizona. I own 91.8 of the stock and a friend of ours owns the remainder.

I have never made a test of the garnet under 34" per cubic yard. I am in shape to make a practical test cheaply. Ask all the questions you wish. My price is $100,000, 30 days examination free and then 6% interest on the price every 3 months in advance and the essence of contract will be time. I have knowledge, I have not mentioned and will not for present.

Were you only a M. E. I would not use some of the formulas I have, but as your heading of letters says Metallurgists, I do.

I find Metallurgists who know nothing of the rare earths only U, Mo, V, and W, and they are not to blame as they are not taught in any school of mines, universities or colleges in the United States but they do give descriptive lectures.

To see is to know, and quantitative analysis is proof.

Please thank D. P. R. for his good interest. I have never mentioned minerals to him, as I now do to you, as I did and yet believe it would be more than Greek to him.

Respectfully yours,

P. S.—We have over 6 miles of ground. We have 4000 of water. I am in correspondence with 2 other parties in your state.

Correspondence and Discussion

Cyanide Mills in Oaxaca

In the JOURNAL of Oct. 14, 1911, there is published a list of the cyanide mills in Oaxaca, from which the impression is conveyed that all are being operated. This is not the case. Of the eleven mills enumerated only three are at present running; some have been idle for years. Of the three mills, one has been operated only at intervals since its completion, and another is not equipped with a cyanide plant.

The figures, given in the following list, for the time of shutdown are approximate only. They are given from memory and may be in error as much as a year in some instances.

La Victoria y Tapada Mining Company; 10 stamps, 1 tube mill; concentration, agitation and slime filtering. Plant finished early this year, but has been running at odd intervals only.

La Soledad Mining and Milling Company; 4 Nissen stamps, 1 tube mill; agitation and filtration. Plant was finished this year. Now shut down, not having run for one month since the completion of the plant.

Compañia Minera de Natividad y Anexas, S. A.; 30 stamps, 3 tube mills; agitation and filtration. Plant commenced operation on a partial scale in January, 1910, was completed in 1910, and since then has run continuously, except for the usual suspensions for repairs. This is a Mexican company, which publishes annual reports with full information of production, costs, profits, reserves, etc., and is listed on the Mexico City stock exchange.

Old Mexico Mining Company; 4 Nissen stamps, and Hendryx cyanide installation. Ran for several years, and has been shut down over a year.

El Socorro Mining Company; 5 stamps (I understand that no cyanide plant of any sort exists at this mine). Has been shut down since 1908.

Tlacolula Mining and Milling Company; 10 stamps, amalgamation and concentration. Has no cyanide plant.

Compañia Minera del Rosario; 5 stamps and leaching plant. Has been shut down over four years.

Los Reyes Mining and Milling Company; 20 stamps and leaching plant. Shut down over four years, except for the reworking of tailings by a tributer.

Emmons mill; 1 set of rolls and small leaching plant. Partly dismantled since five years ago. Small tailings pile was recently reworked by leaching.

Zavaleta Mining and Milling Company; 5 stamps, no cyanide plant, except perhaps on a testing scale. Shut down for the last seven years, except for intermittent attempts.

Santa Catarina mill; 5 stamps and leaching plant. Shut down over two years.

The point I wish to emphasize is that of the mills mentioned, there is but one that is being regularly operated. While there are several mines in the state that are being profitably worked, Oaxaca has been a haunt of wildcat promotions; more so than any other state in Mexico. This is probably attributable to the agreeable climate and the existence of a few rich but pockety veins in the vicinity of a city. Of the many prospects that have been found, hundreds of them, only a few have been developed into producing mines.

OAXAQUEÑO.

Oaxaca, Mexico, Nov. 24, 1911.

Views, Suggestions and Experiences of Readers

The Young Engineer

The question of the policy that a mining company should pursue toward its employees to obtain from them the greatest efficiency, coupled with general good feeling, is one that has called forth much comment as regards what is usually called labor—including that of miners, trammers, timbermen, etc. The same subject in its relation to the engineering department has been somewhat neglected, and this is more strange, because it is in this branch of the industry that many graduates of mining courses find their first employment, and, therefore, are apt to receive their first impressions of practical mining operations. In most large companies, operating a number of properties, this department is usually well organized, having as its chief a man who, by training in the company's service, is fitted for the position, and who by inclination or temperament is apt to remain there as long as the position is in existence. Under him, as assistants, are often four or five younger engineers, more or less fresh from college and anxious to learn and apply the knowledge so gained.

The acquiring of this knowledge is not a difficult matter; owing to the usual varied nature of the work there are few openings for a beginner in mining that offer better opportunities for observing actual underground operations in their many phases. It is only natural for a young engineer, who has made the most of his technical training and who is at all observant, to question many things that he sees being done underground, and it is not rare for him actually to think of a better and cheaper way of doing things. When it comes to putting these suggestion into practical use, a snag is usually encountered. He is too often made to feel that his place is to survey according to instructions and not to meddle with things outside his department. These and many other reasons soon lead him to conclude that his sphere is limited with the company, and he decides to shift his connections as soon as possible. Under such conditions, and they are not uncommon, the sphere of the junior engineer is limited, and this fact doubtless accounts for the almost constant shifting in the engineering departments of many of the larger companies, resulting often in loss to the company and to the individual.

The wisdom of the policy that permits this is questionable. It is the same sort of self-satisfied contentment that marked the industrial concern of 30 years ago. In this space of time many have developed systems whereby the suggestions of employees are not only gladly received, but, if adopted, are rewarded in some manner. Many of the well known mechanical devices of late years are directly traceable to this. If the wide gap, which too often exists between the operating officers of mining companies and the junior members of the engineering department, the men who, in pursuit of their daily work, are in close touch with all of the underground workings, were bridged with a policy which welcomed and expected suggestion and criticism, there is no doubt that benefit would result for both. Give the young engineer a greater chance to solve operating problems, and when he deserves, reward him in some manner, however trifling.

JOVEN.

Santa Eulalia, Chihuahua, Nov. 21, 1911.

Efficiency of the Turboblower

In the article on turboblowers in the JOURNAL of Sept. 9, 1911, p. 506, it is stated that the steam turbine and turboblower shown in the illustration were made by Kühnle, Kopple & Kausch. The correct name and address of this company is Aktiengesellschaft Kühnle, Kopp & Kausch, Frankenthal, Bavaria, Germany.

L. GARRETT SMITH.

Breslau, Germany, Nov. 20, 1911.

October Operations at Goldfield Consolidated

During October, 1911, the Goldfield Consolidated company produced 30,626 tons of ore, worth $860,153, an average of $28.09 per ton. All of this was milled with an average extraction of 95.31 per cent., amounting to $26.77 per ton. Total net profit was $616,141, or an average of $20.12 per ton. During the month 3152 ft. of development work were done.

OCTOBER COSTS AT GOLDFIELD CONSOLIDATED

Mining: Development	$0.83	
Stoping	2.04	
		$2.87
Transportation		0.08
Milling		1.96
Marketing		0.74
General expense		0.38
Bullion tax		0.31
Construction		0.46
Total cost of operation		$6.80
Miscellaneous earnings		0.15
Net cost per ton		$6.65

At the Clermont the 466 intermediate between the 600- and 760-ft. levels was extended 30 ft. and produced 153 tons of ore averaging 1.53 oz. This orebody was also found by a raise from the 427 drift on the 750-ft. level, 20 ft. above the level. The 413 sill was extended during the month, producing 879 tons of ore averaging 2.87 oz. The downward continuation of the 413 orebody was indicated by the 420-I raise and by the 420-K raise, the latter intersecting the ore at a hight of 35 ft. The ore thus exposed averaged 2 oz. The 510 sill from the 524 intermediate was extended and produced 156 tons of ore averaging 1.02 oz. The Grizzly Bear shaft was sunk to a point 95 ft. below the 1200-ft. level.

At the Mohawk, Nos. 20 and 21 crosscuts from No. 8 drift were cut out for a sill, producing 653 tons of ore that averaged 1.55 oz. The sill in No. 13 drift was extended, producing 375 tons of 2.11-oz. ore. The downward continuation of this ore was also indicated by a raise from the 290 intermediate. On the 450 level the 345 sill was extended and produced 145 tons of ore that averaged 1.89 ounces.

At the Red Top the 101 sill was extended, producing 563 tons of 5.62-oz. ore. The 477 intermediate was advanced in ore, producing 151 tons averaging 1.67 oz. A crosscut in the hanging wall of the 305 drift north of the main crosscut produced 19 tons of 5.05-oz. ore. At the Laguna, the Hazel shaft was cleaned out to the bottom and the drifts on the 718-ft. level were cleaned out preparatory to prospecting the quartz in that section. At the Combination the 136 sill was extended and produced 422 tons of 3.92-oz. ore. Superintendent Thorn states that the construction of the concentrate-residue treatment plant at the mill is progressing at a satisfactory rate.

Tin Discoveries in Rhodesia

JOHANNESBURG CORRESPONDENCE

Excitement has recently been caused by several tin discoveries in widely separated districts of Rhodesia. The existence of tin has long been suspected as ingots of tin have been found in ruins in the Insiza district and near Bulawayo, and bronze weapons in other places. The first discovery was made in 1909 on the Uniabi river, where tin oxide was found to occur in small quantities in chloritic schist near a granite contact. This was not payable.

The next discovery was made northeast of Salisbury in the gold-mining district of Enterprise, where gold occurs in mineralized-schist bands. The tin ore, cassiterite, occurs in pegmatite dikes more or less altered to greisen. These dikes run north and south through epidiorites with intercalated schist and banded ironstone, with some limestone, while to the north are found the quartzites and conglomerates in which the Shamva mine occurs. These rocks are surrounded by intrusive granites which have caused contact metamorphism. Intrusive dikes of dolorite containing much pyroxene also traverse both granite and metamorphic rocks. The granite is a biotite granite often containing hornblende. Barren pegmatite dikes of white feldspar and quartz are common on the edge and in the granite.

The greisenized pegmatites traverse the metamorphic rocks and are noted for the presence of a pink mica lepidolite with quartz and feldspar with fluorite, granite, topaz and cassiterite as accessory minerals. The structure is sometimes coarse, the tin ore sometimes occurring in crystals up to an inch in length and in other parts fine grained. Tourmaline is absent in the dikes though it is a common mineral near the granite contacts in other districts. Farther north, at Abercorn, the tin is found on the northern contact of the granite mass bounding the Enterprise district on the north. The tin occurs here in greisen of a rather gneiss-like appearance and also in pegmatite. Lithia mica with green tourmaline occurs in the vicinity but the tin-bearing rock contains mica of a white to greenish color.

These tin occurrences are similar to several in the United States, especially in South Dakota. So far exploration has shown that the Enterprise tin discoveries are scarcely likely to be important, as the tin ore appears to be irregular in its distribution and denudation has not been sufficient to furnish large alluvial deposits of any importance. In the Abercorn district prospects are more favorable for the opening of payable dikes and some alluvial tin.

Recently promising discoveries have been made in the more eastern portions of Rhodesia in the Victoria district, which was one of the first districts settled in Rhodesia. Here greisen dikes occur in a belt of epidiorite and actinolite and micaceous schist from four to eight miles wide and 30 miles long, surrounded by granite. The dikes consist of quartz with white sericite and green muscovite, the feldspar having been replaced by sericite and cassiterite with occasional tourmaline. Dikes showing pink lepidolite are in evidence but do not carry tin ore in quantity. Large masses of crystals of cassiterite up to 30 lb. in weight have been found as float, while tin ore in what appears to be payable proportions occurs in several of the outcrops, and the prospects of procuring a large tonnage from these dikes, which are from 10 ft. in width, upwards, appear to be promising.

The Speculative Situation in Silver

Messrs. Samuel Montagu & Co. write, under date of London, Nov. 23: "It is now 17 days since the market has been shorn of its freedom through the corner in delivery created by the Indian speculative group, who apparently have no immediate intention of relaxing their hold. On the similar occasion last year the tension, involving a premium of varying extent, was maintained for exactly one month, from July 2 to Aug. 2. As the number of outstanding bear contracts is lessening daily, and the amount of dealers willing to buy, at the present artificial prices, is extremely limited, the maintenance of so large a premium entails material support on the part of those who have engineered the corner, and their holding in silver and forward contracts combined has been increased materially. Whether this inflated speculative stock will be easier to dispose of than that held for nearly two years past, or whether the tactics adopted—of squeezing banks and others who, in the fair course of business, have the misfortune to be short of silver against exchange—are likely to enhance the price of silver in the long run, is a matter of opinion.

"China has been taking advantage of the high prices now current to ship silver to Bombay. . . . . Referring to the occurrences in the cities which were the scene of actual conflict, it is said by local authorities that these ebullitions were comparatively insignificant, and in other cities, as Kiukiang and Ichang, were entirely absent. Surely this capacity of the Chinese for managing their local affairs should have received more recognition from foreign observers than has yet been accorded to it. It augurs well for the future of the nation that even in the throes of a revolution there is little evidence of anarchy anywhere in the Empire."

The Bisulphite Process

The so called "Bisulphite Process" for the treatment of zinkiferous ores has been described in the *Mining Journal*, Oct. 21 and Nov. 11, 1911, evidently from data supplied by the company exploiting the process, although that is not specifically stated. This is noteworthy as the first reasonably clear exposition of this process that has been published.

The process consists essentially in dead-roasting the ore and then digesting it with water into which sulphur dioxide from the roasting is introduced in a special apparatus. The solution of zinc bisulphite thus obtained is separated, the residue going to lead-smelting furnaces and the solution to an apparatus in which the zinc is precipitated as monosulphite, the sulphur dioxide that is evolved at the same time being returned to the process. The zinc monosulphite is calcined to oxide, which is said to be of the density required for reduction and distillation in retorts in the ordinary way.

As thus described, the process possesses no features differing from the proposals of many metallurgists in the past, and it is to be supposed that the novelty of the present process lies in the methods of conducting the several operations and the design of the apparatus employed.

Sulman & Picard, the engineers for the company, are credited with the estimate that the cost of a plant of 36,000 tons annual capacity will be about £25,000, and the following for operating expenses: Ore delivery, ex-ship into bins, 1s. 5d.; crushing, 1s. 6d.; roasting, 4s.; cooling and delivery to extraction plant, 6d.; gas cooling and propulsion, 2d.; lime for roasted ore, 6d.; lixiviation, 2s. 10½d.; precipitation, 1s. 5½d.; handling and draining of monosulphite, 6d.; pumping, 2d.; calcining monosulphite, 3s. 5d.; yard labor, sacking of oxide, etc., 1s.; general expense, including administration, repairs and renewals, etc., 3s. 11d.; total, 21s. 5d.

The articles from which we are quoting are replete with estimates of profit to be expected in the treatment of certain ores, but as has been characteristic of all the publications respecting this process they omit to give any real technical data. It is said that in the treatment of ore from California, containing 35.2 per cent. zinc, 2.75 per cent. copper and 1.5 oz. silver per ton, by the British Metals Extraction Company, at Swansea, the recovery was 92 per cent. of the zinc, 71 per cent. of the copper and 100 per cent. of the silver. A plant for the treatment of the ore of the Roseberry mine is now reported to be in course of erection in Tasmania.

Men Employed in Zinc Industry

WASHINGTON CORRESPONDENCE

The Immigration Commission, whose report is shortly to be issued in complete form, has prepared for publication a report on "Diversified Industries" in which is included a short discussion of the composition of the working forces engaged in zinc smelting. The results of the investigation are summarized in the accompanying table.

MEN EMPLOYED IN ZINC SMELTING

General Nativity and Race	Number	Per Cent. Distribution	General Nativity and Race	Number	Per Cent. Distribution
Native-born of native father, white	65	4.6	Foreign-born, by race—Con.		
Native-born of foreign father, by country of birth of father:			Irish	16	1.1
Austria-Hungary	4	0.3	Italian, north	2	0.1
Canada	2	0.1	Lithuanian	16	1.1
Denmark	1	0.1	Norwegian	1	0.1
England	17	1.2	Polish	496	34.9
Germany	371	26.1	Russian	27	1.9
Ireland	55	3.9	Ruthenian	1	0.1
Russia	33	2.3	Scotch	3	0.2
Scotland	4	0.3	Slovak	3	0.2
Sweden	1	0.1	Slovenian	58	4.1
Switzerland	1	0.1	Austrian (race not specified)	27	1.9
Foreign-born, by race:			Swiss (race not specified)	1	0.1
Canadian (other than French)	1	0.1	Grand total	1,423	100.0
Croatian	2	0.1	Total native-born of foreign father	489	34.4
English	13	0.9	Total native-born	554	38.9
French	3	0.2	Total foreign-born	869	61.1
German	199	14.0			

Chronology of Mining for November, 1911

Nov. 3—Waldemar Lindgren was appointed chief geologist of the U. S. Geological Survey.

Nov. 9—Explosion in Adrian mine, of Rochester & Pittsburg Coal and Iron Company, at Punxsutawney, Penn., killed eight men.—Minority stockholders of Alice Gold and Silver Mining Company began suit against Amalgamated company, at Helena, to prevent dissolution of former company.

Nov. 11—Cripple Creek deep-drainage tunnel encountered a flow of water which resulted in draining the lower levels of several important mines in the vicinity.

Nov. 15—Freight reductions went into effect between Salt Lake City and Missouri river points.

Nov. 16—District court, at Colorado Springs, Colo., issued temporary injunction restraining the sale of 11 Cripple Creek properties for taxes.

Nov. 17—Canadian coal strike settled by agreement signed at Hosmer, B. C., under which the miners returned to work on Nov. 20.

Nov. 18—Explosion in mine of Bottom Creek Coal and Coke Company, at Vivian, W. Va., killed 18 men.

Nov. 22—Announcement that Consolidated Goldfields of South Africa had acquired extensive interests in Alaskan dredging lands, through the operations of the Granville Mining Company.

Nov. 23—Bankruptcy proceedings were commenced in the United States Court, in New York, against the Nevada-Utah Mines and Smelters Corporation.

Nov. 24—John D. Ryan purchased control of Live Oak Development Company at $30 per share.

Nov. 25—Governor Johnson appointed William H. Storms as State mineralogist of California.

November Dividends

The accompanying table shows the amount per share and total amount of the dividends paid during November, 1911, by a number of mining and industrial companies in the United States, Canada and Mexico.

The dividends shown in the table for November, 1911, amount to $11,710,431, as against $11,028,300 for November, 1910, while the dividends by mining companies and allied industries as reported on the JOURNAL amount to $169,525,137 for the first 11 months of this year as against $149,342,904 last year.

UNITED STATES MINING COMPANIES	Situation	Per Share	Total
Arizona Copper, c	Ariz.	$0.042	$53,842
Boston-Sunshine, g	Utah	0.03½	5,632
Bunker Hill & Sull., l.s	Ida.	0.20	65,400
Bunker Hill Con., g	Cal.	0.07½	15,000
Golden Cycle M. & M., g	Colo.	.....	1,530,000
Homestake Mining	S.Dak.	0.50	109,200
Hecla, l.s	Ida.	0.02	20,000
Ophir Silver, s	Nev.	0.10	20,160
Parrot, c	Mont.	0.15	34,477
Stratton's Ind., g	Colo.	0.06	60,625
Utah Con., c	Utah	0.50	150,000

COAL, IRON, INDUSTRIAL AND HOLDING COMPANIES	Situation	Per Share	Total
Amalgamated, c	Mont.	$0.50	$769,440
Butte Coalition, c	Mont.	0.25	250,000
Cambria Steel	Penn.	0.62½	562,650
Inter'l Nickel, pfd	U. S.	1.50	133,689
Lehigh Coal & Nav	Penn.	1.00	482,956
National Carbon, pfd	U.S.	1.75	78,750
Penn. Steel	Penn.	.....	577,500
U. S. Steel Corp., pfd	U.S.	1.75	6,304,919
Warwick I. & S	U.S.	0.40	59,468

CANADIAN, MEXICAN AND CENTRAL AMERICAN COMPANIES	Situation	Per Share	Total
Amparo, g.s	Mex.	$0.03	$60,000
Buffalo, s	Ont.	0.03	30,000
Coniagas, s	Ont.	0.45	360,000
Crown Reserve, s	Ont.	0.05	88,440
Tem. & Hud. Bay, s	Ont.	3.00	23,283

Details of Practical Mining

This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent to telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of a pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

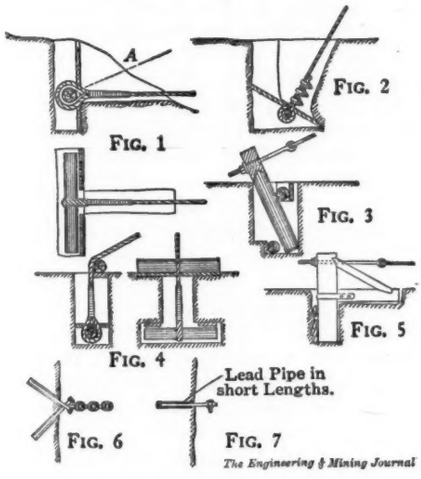
Anchoring Wire Ropes

BY A. LIVINGSTONE OKE*

In and around mines wire ropes are used for so many purposes that the accompanying diagrams may be found useful to illustrate the methods that may be adopted for anchoring them.

In Fig. 1 is shown in section and plan how to secure the end of the rope in soft soil, such as a gravel bank. A trench is dug in the form of a T, its size depending on the load to be put on the rope. With this arrangement, which is one of the more generally employed methods, the angle of lead of the rope must not exceed that shown by the dotted line at *A*. If a steeper lead becomes necessary the modification shown in Fig. 2 may be used, in which case the trench is undercut as shown, and the planks inserted normally to line of lead.

In Fig. 3 is shown a method of anchorage to a post and is to be recommended where some means of tightening the rope has to be allowed for. Fig. 4 shows a method which admits any desired angle of lead to the rope; it consists of a pit with its lower sides undercut to admit inserting the cross timber. Fig. 5 is an adaptation of the method shown in Fig. 3, where the lead is horizontal. Fig. 6 shows a method particularly adapted for more permanent work in mines. Fig. 7 is the better method, the end of the bar being split for a wedge and the whole calked with lead; for vertical upward pull cement may be used.



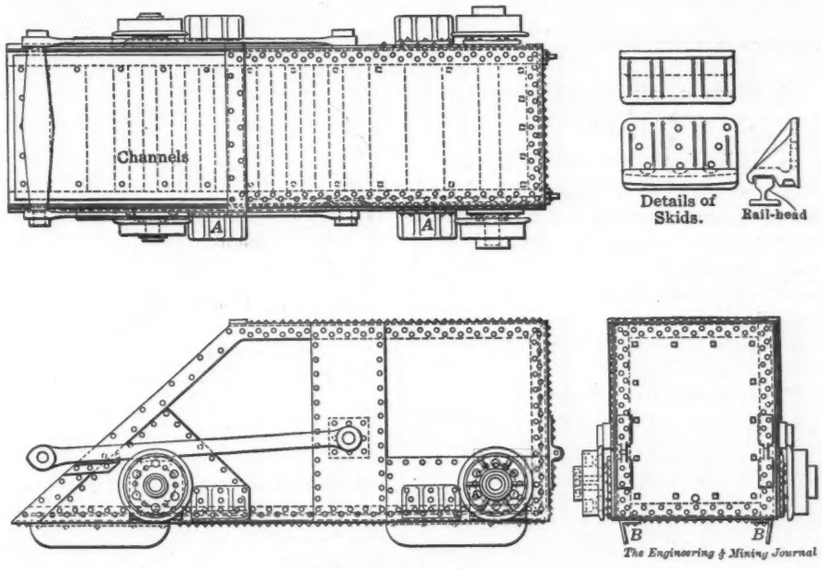
WIRE-ROPE ANCHORAGE

*Manager, San Juan Mines, Ltd., Rodeo, San Juan, Argentina.

The Ahmeek Skip

The skip shown in the accompanying illustrations is the one used in the shafts of the Ahmeek mine in the Lake Superior copper district; the shafts are inclines, and the rails are carried on concrete stringers. This permits more room under the body of the skip than when the track is carried on cross ties as is necessary in the shafts of the conglomerate mines of the Calumet & Hecla company, where the swelling of the foot makes it impossible to use concrete stringers. In general design the Ahmeek skip is quite similar in construction to those employed where cross ties are necessary, except that the wheels are placed lower down on the sides of the skip so that the bottom of the skip body is 2½ in. above the rails. Moreover, as there are no ties, a timber stringer is carried along each side of the track so as to guide the skip back on the rails in case it should jump off.

A noteworthy feature of the construction of this skip is the use of skids or shoes, *A* in the sketch, made of cast



THE AHMEEK SKIP

Speaking Tubes in Mines

Speaking tubes are used for communicating from one part of the mine to another in the Allouez mine in the Michigan copper country. They can be used up to distances of 1000 ft., beyond which the service is not satisfactory.

In this mine, the speaking tubes are 1½-in. pipes. A tee is inserted in the line wherever it is desired to establish a point from which communications can be sent. The mouthpiece is made by screwing a short nipple into the tee. The nipple is closed by a wooden plug, attached to a string or chain hanging from the pipe to prevent loss. The nipples are kept closed when not in use.

To call a station a knocker is used, consisting of a 2-in. nipple that encircles the 1½-in. pipe above the tee. Lifting and dropping the knocker on the tee causes a sound that is clearly transmitted by the pipe. For greater distances than 800 ft., 2-in. pipe should be used.

iron to carry the skip in case that a wheel should break. These are recessed for the rail, as can be seen in the detailed drawing, so that while riding on the skid shoe the skip will stay on the track as well as if the wheel were in place. This prevents the wrecking of the shaft timbering, although the friction on the shoe wears it out with one application; while the skip has to be taken out and fitted with a new shoe as well as a new wheel, this is far cheaper than repairing the shaft or having the hoisting engine strained.

To aid in guiding the skip back to the rails two guide plates are bolted on each side at the bottom of the skip. These guide plates, marked *B* in the sketch, come in contact with the sides of the concrete stringers, and the wheels are guided back to the rails. With these two devices about as much provision is made against skip accidents in the shaft as is possible in inclined shafts. The bottom of the skip, down to the point at which the bale is fastened, is reinforced with channels, and in order to take the wear a replaceable bottom and an end-plate liner are bolted on, as these are two parts that wear the most in the body of the skip.

Verdigris on Amalgamating Plates

By Algernon DelMar*

In the JOURNAL of Sept. 9, 1911, it is recommended that a 2 per cent. solution of potassium cyanide be used to clean copper plates for spreading the amalgam over bare spots. While it is right to build up a thick coating of amalgam over the bare spots I have found that prevention is better than the cure.

The preventive in this case is not to use chemicals of any sort on the plates but to use a wash of borax soap. I learned this from Courtney De Kalb at the Exposed Treasure mill and since I have made use of borax soap I have had no difficulty with verdigris. Even with plates that have been bared of the silver plating and where verdigris ordinarily will appear I find by washing or scrubbing the plates every shift with a solution of borax soap dissolved in hot water that the plate readily amalgamates and the soap keeps the air away from the surface of the plate so that when the water is turned on the plate is bright.

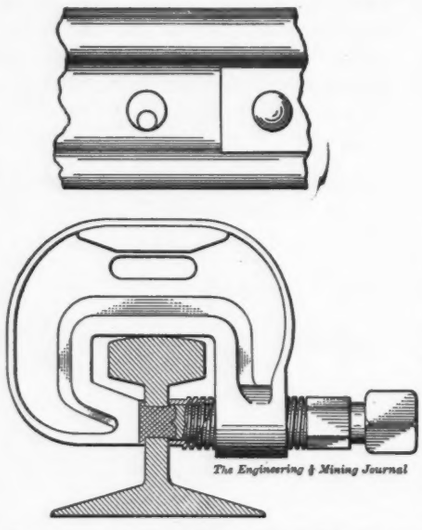
I used this method for two years at one mill and always had the plates bright from top to bottom. I remember some years ago I had to amalgamate in a mill where the plates were in poor condition, verdigris showing all over. The trick was to brush up the plates quickly all over at the finish and make haste to turn the water on for the verdigris came to the surface almost as soon as the brush left the plate. The management insisted on keeping the plates stripped of amalgam and depended upon the millman to find a means of keeping the plates in good condition.

*Mining engineer, Fort Bidwell, Cal.

Rail Bonding in Mines

By G. H. Bolus*

In electric tramways the track rails are used as returns to complete the circuit. The rail section is of ample capacity to carry the current, but it is at the rail joint that the resistance is greatest. It should be remembered that all resistance causes a loss or drop of voltage at that point when current is flowing. This drop is proportional to the current; that is, suppose that a rail joint, including the bond, has a total resistance of 0.00008 ohm and the current flowing through the rail is 200 amp., the loss in voltage at the joint will then be 0.016 volt; if the current is 400 amp., the loss will be twice as great, or 0.032 volt. Therefore, it follows that the larger the current value, the greater will be the loss at the joint, and when it is considered that there are about 176 joints in one mile of 30-ft. rail, it will be readily seen that the total loss is of considerable amount. As the return current is being conducted to the power house through the rails, it encounters an appreciable resistance in the rail itself. The accompanying table gives the resistance per 1000 ft. of various weights of continuous rails.



Channel Pin and Compressed Terminal Rail Bonds and Clamp

Essentials of a Good Bond

For bonding rails in mines, two methods are in common use; the channel pin or bonding cap and the compressed-terminal bond. The channel-pin method, as shown in the upper part of the accompanying illustration, consists in driving a steel plug in a hole in the rail, having first inserted a piece of round wire. In the place of the channel pin may be substituted a bonding cap, or, in some cases, a copper bonding sleeve. The wire used is usually old, worn trolley wire. This form of bonding will give good results for a short period, but moisture soon enters and destroys the contact, and unless the joint is immediately repaired, it will soon offer as much resistance as an open circuit. This method should not be used except for temporary work.

The compressed-terminal bond consists of a head or terminal formed on the end of a copper conductor, this head being adapted to be compressed in a hole in the rail by means of a compressor, as shown in the lower part of the accompanying illustration. This tool is capable of exerting from 10 to 20 tons pressure on the head or terminal of the bond, thus causing copper to flow or expand in the hole in the rail and make an intimate contact. It will be apparent when a compressed-terminal bond is once installed, that the possibility of oxidation is much lessened.

RESISTANCE OF STEEL RAILS

Weight Per Yd., Lb.	Sectional Area, Sq.In.	Equiv. Copper Cap. in C.M.[1]	Ohms Resistance per 1000 Ft., One Continuous Rail
16	1.87	207,000	0.0512
20	1.96	217,000	0.0489
30	2.93	324,000	0.0328
40	3.91	433,000	0.0245
45	4.40	487,000	0.0218
50	4.89	540,000	0.0197
60	5.87	650,000	0.0163
65	6.36	704,000	0.0157
70	6.85	758,000	0.0140
75	7.34	812,000	0.0131
80	7.83	867,000	0.0123
85	8.32	920,000	0.0115
90	8.81	975,000	0.0109
95	9.90	1,030,000	0.0103
100	9.79	1,080,000	0.0098

[1] Ratio of iron to copper capacity, 1:11.5.

Compressed-terminal bonds are made in several forms, some to go under and others to be placed around the fish plate. On new work, where the roadbed is good, a bond installed under the fish plate will be found satisfactory, but for old work which is to be bonded, or for rebonding, the bond which goes around the fish plate is best, as the bolt holding the fish plate will become so rusted as to make removal difficult, sometimes necessitating cutting off the bolthead or nut.

Effects of Poor Bonding

Poor bonding will make itself apparent at a mine in excessive loss in voltage, causing locomotives to stall with their loads, in inefficient operation of pumps, etc., and in burning out of armatures, due to this low voltage.

I recently made a test of a 10-ton locomotive in a mine in which the bonds were in particularly bad shape, all of them showing a high resistance when tested

*Engineer, mining division, Ohio Brass Company, Mansfield, Ohio.

with an instrument. Thirteen loaded cars were coupled to the locomotive and the machine started up a slight grade, with fluctuation in the voltage and current as follows:

Volts	Amperes
170	220
130	300
90	400
50	420

This test was made at a point about 1000 ft. from the power house, and the overhead supply circuit consisted of 14-0 trolley wire and 14-0 feeder wire in parallel. At the greatest current, which was indicated on the instrument (420 amp.), the loss in the overhead circuit would only amount to 11 volts. The lowest voltage indicated between track and trolley was 50 volts, and there were 250 volts at the power-house busses; this left 200 volts lost in transmission. Since there were but 11 volts loss in the overhead circuit, it follows that 189 volts were lost in the track return. By the installation of the proper size and kind of bond, the voltage could have easily been brought up to 210 or even more at the motors, and this would have permitted the locomotive to pull the load with ease. At some of the points of the track return in the case cited, the rail joints would arc viciously as the locomotive traveled over a certain section of track. Inspection of these joints showed that the bonds, which were of the channel-pin variety, were so oxidized as to offer an extremely high resistance to the flow of current, in some cases being almost equivalent to an open circuit.

At the Roodepoort Central Deep, Ltd., the waste sorted amounted to 29 per cent. of the ore mined last year. The width of vein was 25 in. An effort is now being made to work narrower stopes by increasing the sorting 7 per cent.

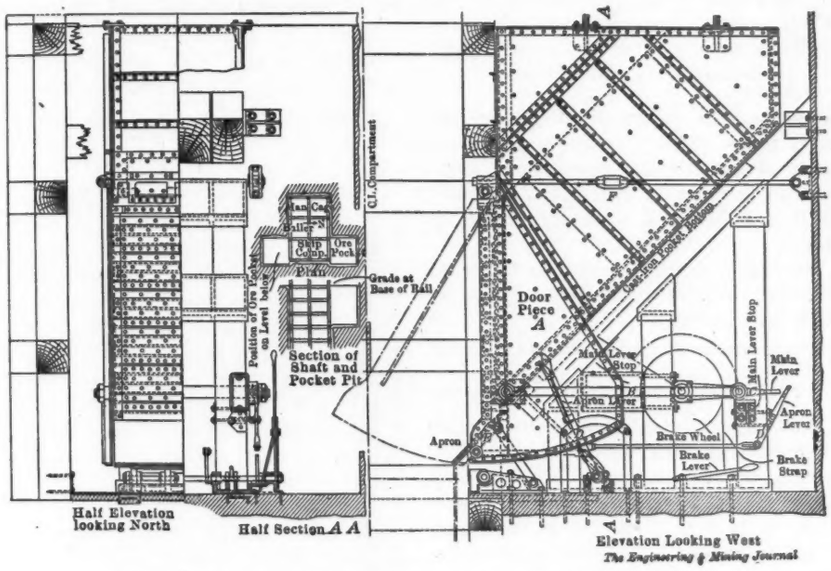
Red Jacket Ore Pockets

The Red Jacket shaft of Calumet & Hecla is the one shaft in the United States equipped with a Whiting hoist. This is used in raising the ore, while an ordinary drum hoist is used for raising men. Skips holding 7½ tons are used and the shaft is arranged so that the pockets for the different skips are on alternate levels. These skip pockets are large enough to hold 9 tons, but only three cars, a skip load, are dumped in at a time.

This pocket is lined with steel, on top of which, both on the sides and bottom, wearing plates are bolted. The steel bottom plate rests on a cast-iron bottom plate 4 in. thick which in turn rests on a bottom of 12x12-in. timbers, as trouble was experienced with the steel bottom plate when it rested directly on the timber bottom on account of the size of the boulders—some weighing a ton and a half—that are dumped from the cars into the skip pocket.

This skip pocket has a hand-operated swinging door as shown in the accompanying drawing. The door piece *A* is hinged at the top, the strain on the hinge seats being carried back to rock wall of the pocket pit by means of two bolts equipped with turnbuckles. A lever, *B*, leads back from this door to the main locking lever, *C*, to which it is connected by a pin joint. The door as it swings back after it is released by easing on the band brake (with which the shaft of the locking lever is equipped so as to prevent the return of the door before the pocket has emptied itself, as might be the case if there was much fine ore in the pocket) forces this locking lever past dead center so that the weight of the ore pressing against the door holds the lever against the inside stop that limits its downward motion. The outward swing of the door is limited by the locking lever coming in contact with a similar stop at the other end of its range of travel. In case that this locking lever sticks so that a man can not conveniently start it by a moderate lift on its outer end, the skip tender resorts to the use of a wooden auxiliary lever that is fastened to the back post of the pocket so as to aid in starting the locking lever; but this is not usually necessary.

To bridge the gap between the skip and the mouth of the pocket, an apron *E*, is provided, which is thrown in by means of either of two levers *D*, shown in the drawing. This apron also is equipped with a wearing plate.

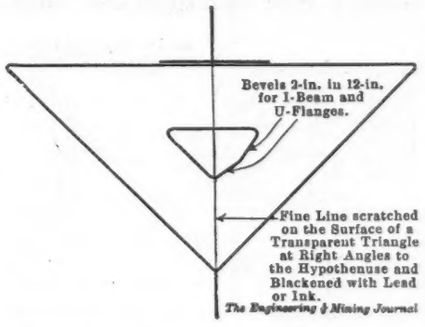


DETAILS OF A STEEL ORE POCKET IN RED JACKET SHAFT

A Time Saver for Draftsmen

BY F. D. BUFFUM*

A draftsman may save much time in making a few lines on a drawing that is not tacked down, or in making sketches, by scribing a line on a transparent 45-deg. triangle, from the apex of the 90-deg. corner perpendicular to the hypotenuse as shown in the accompanying sketch. This line may be filled with lead or ink. The scribed line, when placed over a line on the drawing, permits drawing a line at 45 deg. or perpendicular to it, depending upon which edge of the triangle is used.


Bevels 2-in. in 12-in. for I-Beam and U-Flanges.
Fine Line scratched on the Surface of a Transparent Triangle at Right Angles to the Hypothenuse and Blackened with Lead or Ink.
The Engineering & Mining Journal

TRIANGLE WITH CENTRAL SCRIBE LINE

Where much designing in structural steel is to be done, the inner opening of the triangle may be cut to slope in the ratio of 1:6, as shown in the sketch, for drawing the bevels of I-beams and U-flanges.

Kinks for the Drill Runner

A useful aid in running a stoping drill is a piece of drill steel three or four inches long, tempered at both ends. Whenever it is desired to drill the hole a few inches deeper than can be done with the longest bit, this piece of steel is put into the chuck of a machine, thus adding its length to the effective length of the drill.

*Scottdale, Penn.

When drilling in hard ground, the face of the hole should be kept as large as possible. As long as the bit is cutting well it should be used, but a partly dulled bit should never be used a second time if a sharp bit can be obtained.

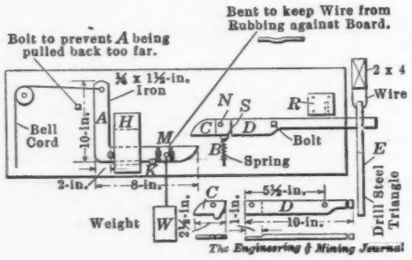
Sometimes a drill is a little too long to follow the one previously used. By putting this piece of steel in the chuck, the shorter bit can be used to drill the hole a little deeper, so that the next longer bit will fit readily in the hole from the setup. Sometimes it is desirable to put in a hole a few inches deeper than the length of the longest drill. This can easily be done by inserting the short chuck piece.

After using this device a machine runner would not want to try to get along without it. At the mine where this device was originated there are few holes drilled where it is not used. Its cost is nothing except a few minutes of the time of the blacksmith.

A Mine Signal Gong

By C. H. Fox*

The signal gong shown in the accompanying illustration permits the triangle to give a clear sharp signal when struck.



ARRANGEMENT OF LEVERS FOR STRIKING TRIANGLE

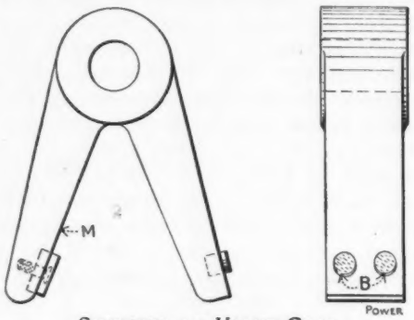
When the lever *A* is pulled back, it strikes the end of lever *C*, and the arm *D* is carried upward, but after being pulled far enough it passes and allows lever *C* to return under the tension of spring *B*. When lever *D* returns, it strikes the triangle *E*. The small spring in the block of wood *R* forces the lever *D* down after it has struck the triangle, thus permitting the triangle to vibrate freely.

When the tension in the bell cord is released, the weight *W* pulls the lever *A* back to its original position. The bolt *K* prevents the lever from being pulled down too far. As *A* is being pulled down it strikes the end of *C*, which is free to move downward about the point *N*. Thus *A* passes without moving lever *D*. After lever *A* has passed lever *C*, the latter returns to its original position, due to the action of spring *B*. It cannot move upward about *N* beyond its normal position for it catches at *S*. The wooden block *H* is cut out on the back so as to guide lever *A* toward lever *C*. The weight *W* has a tendency to pull *A* out from the board, so that it would pass *C* without coming in contact with it.

*Mizpah Hill Club, Tonopah, Nev.

Making Corliss Valve Gear Noiseless

The accompanying illustration shows a method of rendering some forms of corliss-engine valve gears practically



SILENCER ON VALVE GEAR

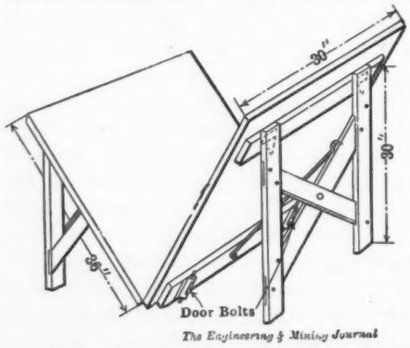
noiseless. It is stated in *Power* that valve gears which were quite noisy were made almost silent in operation by drilling two holes in the crab claw, as shown at *B*, and inserting pieces of leather in them.

For some gears it might be better to insert the leather at the point shown at *M* in the sketch.

A Folding Camp Table

The large folding table shown in the accompanying illustration will appeal to prospectors and engineers who are living in cramped quarters while in a new field. It is 6 ft. long, 2½ ft. high and 2½ ft. wide, and is constructed of ⅞-in. stock.

The table is made in two parts, each 2½x3 ft., cleated on the bottom. The



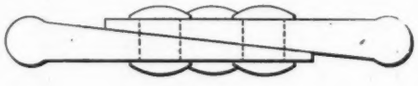
LARGE TABLE FOR A MINE CAMP

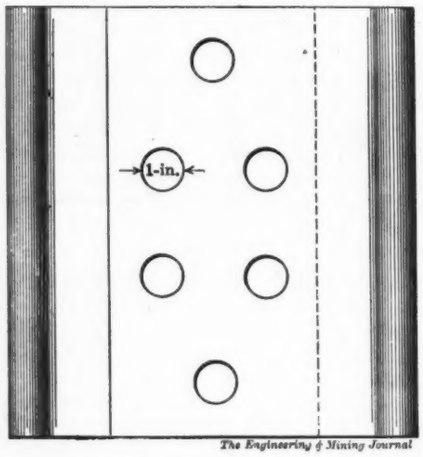
cleats in the middle go on the edge to make a stronger and better place to fasten hinges and bolts. There are also on these cleats door bolts which are slid into place when the table is in position, and the hooks on the rods attached to the center of the cleats are fastened to the center of the cross pieces on the legs.

Shearing Toggle for Crushers

In ore- and rock-breaking machinery there is always danger of breakage by some object such as a hammer head, drill bit, gad or piece of native metal entering with the feed. As constant vigilance to prevent the entrance of such objects would neither be economical or satisfactory, it is customary to make some readily replaceable piece of the crusher with so low a factor of safety that it will fail when the usual strains are exceeded, and in failing relieve the rest of the machine from strain that might rupture or seriously deform it, and to replace which would be expensive and cause delay.

In jaw crushers, the shaft is the part most liable to be deformed by some uncrushable object jamming in the jaws. This is sometimes prevented by making the bearing caps of light cast iron which





TWO-PIECE TOGGLE FOR JAW CRUSHERS

readily break or else strip the threads of the bolts holding them in place.

At the Talisman mine, at Karangahake, N. Z.,[1] two-piece, shear toggle plates are used in the smaller Blake crushers. These plates are held together by six 1-in. rivets as shown in the accompanying illustration. When an unusual strain comes on the toggle the rivets will be sheared before any other part of the crusher is strained to a degree that approaches its limit of strength. An extra set of toggles may be kept at hand to replace those that are sheared. The sheared rivets can readily be bored out and the two pieces riveted together again, making the toggle as good as new.

[1]"Mining and Ore Treatment at Talisman Mine, Karangahake, N. Z.," by Arthur Jarman. *Proceedings*, Australian Institute of Mining Engineers, Sept. 30, 1911.

The Search for Potash Salts

WASHINGTON CORRESPONDENCE

Secretary of Agriculture Wilson has presented in his annual report the results of the inquiry into potash sources, which was made with the $12,000 granted him by Congress at the last session for the purpose of pursuing these inquiries. He says that much potash can be recovered from the immense accumulations of sawdust in the lumbering regions, from the vinasses in the sugar mills, from wool washing, etc. Possible sources of potash include also the bitterns or mother liquors from salt workings. These are now, he states, under investigation. He also says that the desert basins are being explored for surface deposits of potash. After discussing the possibilities of getting potash from various minerals he suggests that extremely cheap power or the incidental production of valuable by-products might possibly make the potash silicates profitable. The mineral which he thinks the most promising source of potash is alunite. Mr. Wilson then turns to the results of the investigations of his Bureau of Soils and says:

"The most promising source of potash at present is found in the large areas of kelp groves or sea algæ lying along the Pacific coast, growing wherever there is a rocky bottom and a rapid tideway, or beyond the surf line, at depths of from 6 to 10 fathoms. These groves are of various areas, from beds of a fraction of an acre to stretches 5 miles in length and 2 or more miles in width. During the past summer our people have mapped about 100 square miles of kelp groves in different localities from Puget Sound to Point Loma and have studied the character of the algæ as well as the conditions necessary to their utilization commercially and to their maintenance as a permanent resource of the country. Many more areas yet remain to be studied and mapped, but from what has been accomplished in this preliminary work I am assured that a conservative estimate shows that the kelp which could be gathered from the 100 square miles already surveyed, and without detriment to the permanence of the groves, should yield 1,000,000 tons of chloride of potash annually, worth at least $35,000,000, or about thrice the value of the present importations of potash salts from Germany. Satisfactory methods of gathering the kelp are yet to be worked out, but present only minor mechanical difficulties. The value of the kelp is, moreover, probably much greater than is represented by the content of potash alone. Our laboratories have shown that iodine and other useful products can be obtained which will pay in large measure, if not fully, for the cost of gathering the kelp and abstracting the potash salts. Enough has been accomplished to show that this country has within its own borders resources to meet the fertilizer requirements of the present, and of a greatly increased use in the coming years. The saving to our people which can reasonably be expected from these investigations is enormously greater than the cost. These investigations are, however, but little more than begun, although begun very well. That they should be liberally supported and actively prosecuted can admit of no possible argument. Economic independence of outside nations with large financial gain to the public at the same time is a desideratum justifying the utmost effort of our scientific investigators and strong sympathy and aid from the people's representatives."

Zinc Dross Prices

One of our correspondents asks about the value of zinc dross and skimmings. While individual contracts vary somewhat as to terms, it is understood that 92 to 94 per cent. drosses bring about 80 per cent. of the St. Louis zinc price, f.o.b. seller's works. That is, if the St. Louis spelter quotation is 5.25c. per lb., 93 per cent. zinc dross will bring 4.2c. per lb. (80 per cent. of 5.25c.). Zinc skimmings carrying 70 to 75 per cent. zinc can be bought at 50 to 53 per cent. of the St. Louis zinc price, f.o.b. seller's works. Here again, this quotation is not per pound of zinc contained, but per pound of skimmings.

Recording Mine Accidents

BY HEATH STEELE*

Much has been written recently about the prevention of mine accidents and the safety of employees. In carrying out any plan for enhancing such safety, it should not only include all measures necessary to prevent accidents, but to prevent the consequences from accidents being more serious than the injury warrants.

SLIGHT WOUNDS EASILY INFECTED

I was much impressed with the importance of this protection while employed at the Goldfield Consolidated mines, as inspector. I found that the hospital cases that gave the most trouble arose from the injured persons who neglected to apply for treatment until the wound had become infected, or did not call regularly for treatment. Such inattention to slight wounds is, at times, likely to be the cause of serious results and often adds to the time of disability.

A simple system will provide for this feature of protection, assuming that the company has established a hospital near the mine. A strict rule should be enforced to require the reporting of all accidents, even of the slightest nature, either by the man himself or some witness. In Fig. 1 is given the form used for such a report.

ACCIDENT REPORT

FROM MINES TO INSPECTION DEPARTMENT

Date ..... Time of accident .....
Name of injured person .....
Goldfield address .....
Working face where accident occurred. No ..... Mine .....
Witnesses to accident. Name .....
Name .....
Name .....

Details of How Accident Occurred

.....
.....
.....
Where sent for treatment .....
Probable length of time layed off from work .....
.....
Signature of person making report.

If accident is of serious nature phone Inspection Department at once. If only slight send report to office at end of shift.

FIG. 1

RECORD OF ACCIDENT

OFFICE INSPECTION DEPARTMENT

Name ..... Address .....
Date ..... Time ..... Reported by .....
Where attended ..... Mine ..... Place .....
Witnesses .....
.....
Reports Made to Legal Department .....
.....
Doctor's Statement .....
.....
Time Off from Work .....
Details .....
.....
Developments .....
.....

FIG. 2

*52 William street, New York.

Around any large mine the number of slight accidents requiring some sort of dressing may average as high as 6 or 10 per cent. of the men employed. If a record of these as well as of serious accidents is kept, it will serve to eliminate certain dangers, as any record of a period of time will undoubtedly show a large percentage of accidents due to practically the same cause.

After the report of an accident has been received, it is an easy matter to check with the hospital authority, or company doctor, to see that proper treatment is being received. A good way to enforce this is to require all men who are disabled to furnish a certificate from the doctor before returning to work, or, where a practice is made of allowing compensa-

YEARLY RECORD OF ACCIDENTS

.....Mine. For.....

Cause of Accident	Jan.			Feb.			Nov.			Dec.			Total		
	Slight	Serious	Fatal	Slight	Serious	Fatal	Slight	Serious	Fatal	Slight	Serious	Fatal	Slight	Serious	Fatal
Total...															

FIG. 3

tion for time off, a certificate to the effect that the injured person had availed himself of all the treatment afforded, and that his absence from work was justified by the nature of the injuries received.

The form shown in Fig. 2 will serve the purposes of keeping a record of the progress of such accidents. If a system is used that will successfully compel all employees to care for their injuries in the proper way, a great deal of unnecessary suffering will be avoided. The miner, as a rule, is apt to think that such care of a scratch is unnecessary, but owing to the fact that most mine waters and gangue material contain elements poisonous to the blood, it is exceedingly risky to allow even the smallest wound to be exposed to them, especially when the blood itself is not in a healthy condition. A thorough, regular cleaning, the use of good antiseptics and clean bandages may save many a finger or hand. The forms shown in Fig. 3, compiled from the detailed record of accidents, will serve to point out many causes of accidents that can be remedied.

The John A. Roebling Sons Company, of Trenton, N. J., announces that the reports of damage caused by the fire at the works, on Dec. 2, have been exaggerated. The fire was confined to one shop only, where special wire was manufactured. The facilities of the other shops will be ample to take care of present work and no difficulty will be experienced in fulfilling all contracts on orders.

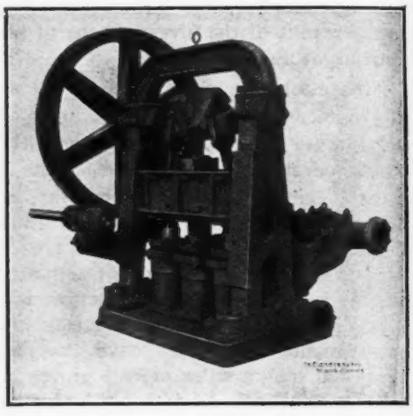
The Copper Situation in Europe

Messrs. Henry R. Merton & Co. write from London, under date of Nov. 25: "The various favorable features in the copper situation, upon which we commented at length last week, have attracted the attention not only of the trade, but also of the outside public, and especially of that portion which on former occasions participated in the great movements which have characterized the copper market from time to time. It is now more generally recognized that the position of the metal has of late become intrinsically stronger, and that a continuation of the present consumption will seriously deplete the reserve stocks, whereby an appreciation in the value—for so long at a very moderate level—would become inevitable. Speculators are always ready to discount the future, and after scrutinizing the copper situation more closely they would seem to have decided upon taking a wider interest in the market. Such at any rate is the explanation of the enormous activity which has suddenly been introduced into the speculative standard copper market on the London Metal Exchange during the past week. After a strong opening followed by a reaction to the closing prices ruling on Friday last, a remarkable spurt in the values of the favorite copper shares heralded a big buying movement in standard copper. Large quantities of the latter were purchased for forward delivery, and in the scramble for supplies, the price was rushed up from £58 to £59 15s., the dealings being on an immense scale, and the excitement strongly reminded of the great boom periods in 1906 and 1907. The demand during one session quite outstripped the supply, and only after the top figure was established operators ventured upon some bear sales and checked the advance. The excitement thereupon subsided, buyers ceased their eager competition, and business settled down to normal proceedings, though the quantities which changed hands around £59 10s. were extremely large, and the undertone of the market remained good. Subsequently the offerings were a little more pressing, and a reactionary tendency let prices down to £59 3s. 9d. America, however, sent strong advices, and speculation broadened once more toward the close of the week when values rose steadily, and finished at top figures, £59 1s. 3d. spot, £59 16s. 3d. forward.

"In consumers' copper the activity in business was no less remarkable, but not quite so feverish as in the speculative medium. The demand from every quarter was positively amazing, but the advance in values was more orderly though equally sharp, and it was more persistently maintained. All the producers and dealers were overwhelmed with orders for refined and raw copper, and every rise in the prices seemed to stimulate the buyers more. . . . Many agencies were compelled to withdraw from the market and refuse fresh offers. The eagerness of buyers was not confined to Europe, where the industrial activity has been in full swing for some time, but American consumers have also made large purchases, and from the fact that specifications are mostly for early delivery, it may be surmized that stocks in consumers hands were practically exhausted. The price of Lake Superior copper is now fully 13⅜c., while electrolytic brands are quoted at 13¼ cents."

Two Mine Power Pumps

The increasing use of electricity in mining operation has brought out the development of new types of machinery to utilize the current to the best advantage. This is particularly noticeable in reference to the pumping equipment.



DIRECT-CONNECTED PUMP INSTALLED BY CLEVELAND-CLIFFS IRON COMPANY

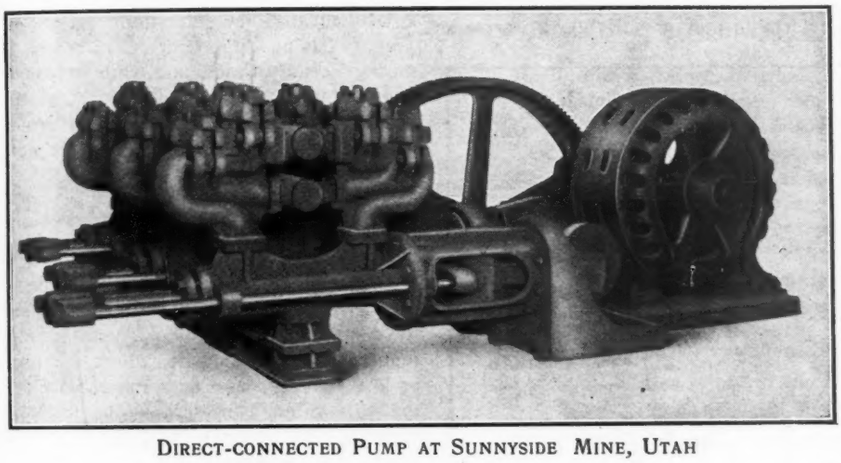
The electric-driven power pump requires less room than steam pumps, does away with the hot steam pipes in the shafts and headings, requires less attention, and has a much higher efficiency. The economy holding good in the small machines, there is no necessity of combining all of the pumping into one large unit on this account. Various types of pumps are used for different conditions of service, the illustrations herewith showing typical machines of recent design as built by the Deane Steam Pump Company, of Holyoke, Massachusetts.

The pumps shown are high-efficiency machines, direct-connected by single reduction of gears to moderate-speed motors, and making in either case a compact, yet wholly accessible, arrangement. The construction is necessarily heavy for this class of work, as continuity of service is the most important item of all. Similar parts are all made exact duplicates, and there are no rights and lefts to introduce confusion in the substitution of new parts. Individual

valve pots with swing bolts for the covers allow quick access to the valves.

The horizontal machine is a 3¼x12-in. double-acting triplex outside-packed plunger pump, connected by single reduction of spur gears to a 125-h.p. Westinghouse induction motor. The motor runs at 495 r.p.m.; the pump runs at 53 r.p.m. and delivers 175 gal. per minute against 2000-ft. head. The water end is made of steel castings. This unit was built for the Sunnyside mine of the Utah Fuel Company.

The vertical pump illustrated is one of a pair of 7x10-in. triplex, single-acting, built for the Cleveland-Cliffs Iron Company. Each is to be driven by a 50-h.p. General Electric induction motor through a single reduction of herringbone gears, which make a smooth quiet-running outfit of high efficiency. The motor runs at 490 r.p.m. and drives the crank shaft of the pump at 62 r.p.m. Each unit delivers 300 gal. per minute against 400-ft. head.



DIRECT-CONNECTED PUMP AT SUNNYSIDE MINE, UTAH

Either of the above machines, as shown by tests, gives an efficiency of 85 per cent. under actual working conditions, and, with proper care, the efficiency can be maintained without the gradual falling off that occurs in some other types of pumps.

Philippine Mining Law

WASHINGTON CORRESPONDENCE

The report of the Bureau of Insular Affairs, just published, contains the following recommendation:

"Amendment of existing law to admit the filing of more than one mining claim on the same vein or lode by the same person, corporation, or association; to facilitate the taking up of claims for placer mining at mines under water; and to extend the time for development of coal claims from one year to three years. There are undoubtedly mineral possibilities in the Philippines, how great is unknown and probably undiscoverable under the present restrictions. In nearly all cases, such traces of movements as have been found are in wild and inaccessible parts, and the expense attached to transportation, even if minerals are found in paying quantities, is too great in the general case to warrant mining operations on any important scale under the limitations now imposed. As in the case of other public lands, it is believed that possible present prosperity should not altogether be sacrificed to the future."

Fall River District, Colorado

BY W. WESTON*

In Gilpin and Clear Creek counties, Colorado, are two great mining districts, the first being a thoroughly proved gold region with a past production of $100,000,000; the second being just across the county line to the west on the mountain slopes at the base of which flows the Fall river. In this district there are two series of veins: One having a northerly course, the veins being chiefly silver-lead and copper bearing, with some gold; the other having an east-west course, being composed of extensions of the veins of the Gilpin County gold belt, which, comparatively shallow surface workings indicate, contain similar ores, viz., iron and copper pyrites rich in gold.

About three miles below the properties herein described is the town of Idaho Springs, just below which is the portal of the Newhouse tunnel. The southern slope of the long range of rounded hills which may be here called the Fall River region, is dotted with the dumps of mines of the early days, which had a good record for rich ores from their outcrops, but which, owing to the long wagon haul to the mills at Idaho Springs, and still longer haul by railway to Denver smelteries for their richest ores, would not pay sufficiently to attract capital or to enable the individual owners to work them extensively.

One by one during the last 30 years, these mines have been quietly purchased by the two Sternberger brothers, of Philadelphia, with the ultimate object of attacking them at the base of the mountain by tunnels, where the product would come out within about three miles on a water grade, from the railway at Idaho Springs. They have organized the Pennsylvania Mining, Power and Reduction Company, incorporated under the laws of the State of Colorado with a capital of $2,500,000. Its holdings now comprise about 300 claims, all patented, and cover an area of nearly 4000 acres. Leopold Sternberger is general manager of the company.

The Lucania tunnel in which the Sternbergers are also largely interested, is now 6000 ft. into the mountain, and has cut what is known as the main lode of the region, about three miles of which, on its course northwesterly, is owned by the Pennsylvania company. The company intends to drive a lateral into the center of the network of veins which constitute its holdings for a distance of about three miles along the lode.

DEVELOPMENT BY TUNNELS

The Lucania tunnel was started in 1902 by John McColl, the present superintendent. Later it was taken over by the Lucania Tunnel Company with the purpose of making it a transportation and drainage tunnel, and to develop 61 claims which the company owns on the surface. The tunnel is 8 ft. high above the track and 9½ ft. in width for double track. It has cut 21 veins, many of which will be worked as soon as a mill is erected at the tunnel portal. The elevation at the portal is 7800 ft. and the depth of the present heading about 1600 ft. below the surface. The tunnel is driven through granite to the point where it intersects the orebody known as the Emerson lode or dike, 1600 ft. vertically below the surface and 1800 ft. on its dip. The foot wall where cut, has a dip of 70 deg. to the north.

About 4000 ft. further up the valley of Fall river is the portal of the tunnel owned by the Pennsylvania company. This has been driven due north for 2000 ft. and is now entering the heart of this company's holdings. The Pennsylvania tunnel is vertically 120 ft. higher than the Lucania tunnel. As soon as sufficient ore reserves have been created it is the purpose of the Pennsylvania company to build a large mill on the property for the beneficiation of the low-grade ores, the smelting ores being shipped by rail to Denver.

The Fall River Power Company owned by the Sternberger brothers has a plant 1½ miles up the river from the portal of the Pennsylvania tunnel. The concrete dam, two miles further up the river, gives a 600-ft. fall of water at 25 cu.ft. per second and a capacity of 1000 h.p. This company is supplying 110 h.p. to the Lucania tunnel.

*Mining engineer, 965 Gas and Electric building, Denver, Colo.

The Braden Copper Company—I

By Pope Yeatman*

This company is mining a low-grade primary copper deposit in eruptive rocks in O'Higgins province, Chile. Ore reserves are estimated at 10,074,616 tons, carrying 2.85 per cent. copper.

*Consulting engineer, 165 Broadway, New York.

NOTE—Abstract of annual report by the consulting engineer.

The mines of the Braden Copper Company are situated in the Andes mountains in the province of O'Higgins, Chile. The property is reached by a State broad-gage road, 158 miles long, from Valparaiso to Rancagua, and thence to the mines by the company's narrow-gage road, about 45 miles long. The mining area consists of 101 claims, covering 1214 acres, and there are about 35 acres of ground held within the city of Rancagua, where the railroad terminal is situated, beside which are held railroad rights of way and various water rights. The concentrator and smeltery lie at about 6700 ft. elevation, the mines about 1000 ft. higher, so that snow sheds must be provided for the railroad.

The summers are cool and pleasant, and the temperature in winter is not low enough to interfere with operations—in fact, construction is carried on during the entire winter.

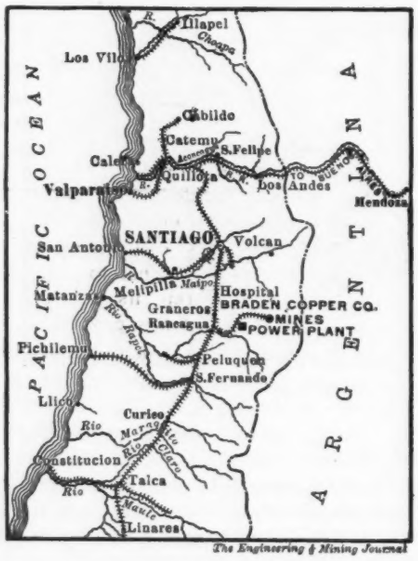
LABOR

Labor on the whole is fairly plentiful but the supply is irregular, depending on the season. The main source is in the agricultural country in the extensive valley in which Rancagua lies, but skilled labor is drawn from the cities. The Chilean workmen are strong and active. They make good miners and perform work at a lower cost than in America. Skilled native mechanics can be obtained for blacksmith, carpenter and machine-shop work. During construction work, as is the case the world over, there is occasionally a shortage of labor, which necessitates some increase in the rate of pay.

The Chilean laborer is proud, independent and improvident, but proves himself on the whole an excellent workman. Drink is his curse, and every effort is used to keep liquor out of the Braden company's mines and plant, and owing to their inaccessibility except by the railroad, this is being acomplished with no mean degree of success. Labor is pretty thoroughly organized in the cities of the republic, but not among miners and common laborers.

GEOLOGY AND TOPOGRAPHY

The mines are situated in a region of great ruggedness, on a part of the main range of the Andes mountains. All the rocks are eruptive. The country rock is andesite, surrounding a body of tuff, which represents the old crater of a volcano. This tuff, light gray in color, is no longer loose, but has been roughly cemented into a hard concrete-like rock mass. This represents material from a great volcanic outburst, which covered the old eruptive material by great thicknesses of volcanic ash, fragments of lava and general ejectamenta. This is well shown in the tuff and volcanic agglomerate forming the core of the crater, made



VICINITY OF BRADEN MINES

up of volcanic material of different sizes in the shape of more or less rounded boulders and shattered material, down to the finest impalpable powder, resulting from the violent ejection of material, part of which fell back into the same crater and was thrown out again and again, thus becoming abraded by contact. Solutions may have had some effect in the rounding of the different fragments, but the principal cause was abrasion. It is close to the contact, but in the andesite that the main orebodies occur. It may be mentioned, however, that a part of the Teniente deposit occupies an old fumarole in the tuff itself.

The volcanic vent is practically circular in horizontal section; though owing to the great denudation on the North side, the outline appears to be oval rather than circular. The diameter of the vent is roughly 4000 ft., and the periphery measured along the outside is about 2½ miles. While in the main circular, there are many irregularities, due to the tuff filling breaks running out into the andesite. At numerous points around the rim of the crater, there are appearances of water sorting, giving a more or less sedimentary appearance to the tuff, and showing evidence of a probable crater lake occupying the old volcanic basin.

The slopes of the mountains are steep—as much as 30 per cent. is general. There is practically no vegetation and a large part of the slopes is so steep as to be devoid of sliderock. The watershed is toward Teniente creek, which joins the Coya at the smeltery site; the latter stream joining the larger Cachapoal close to the power site—18 or 20 miles distant.

Geologically the mountain range is young, having supposedly been formed during Tertiary times, and while volcanic and solfataric action have long since ceased, movements of the earth's crust are still general, as indicated by the not uncommon earthquakes.

OREBODIES OCCUR AROUND PERIPHERY OF CRATER

The orebodies occur around the periphery of the crater in the andesite, at its contact with the tuff. These occurrences represent andesite, which is more or less shattered and near the contact of the tuff often considerably brecciated, carrying the copper minerals in the cracks and openings.

The mineral was deposited after the time of great volcanic disturbance, "during the closing stages of igneous activity and is aqueo-igneous in development." The minerals making up the ore have been deposited from ascending hot solutions, mainly filling cracks or replacing some of the constituent minerals of the andesite. The richer portions are apt to be where the greatest brecciation is, except where the brecciated material has been closely filled with tuff, "originally in the form of mud forced into the interstices of the breccia as an emulsion." In the case of the Teniente "pipe," which represents an old hot-spring channel, the loosely agglomerated boulders of tuff and breccia, have been coated by mineral, either deposited in open channels or replacing some of the tuff itself.

Denudation of the surface has been in some cases more rapid than oxidation, and the sulphide zone often reaches to the surface. In the case of the Teniente "pipe," however, oxidation has been carried to a considerable depth and hence a good deal of mineral is secondary, there being considerable chalcocite

and especially cuprite and metallic copper; these latter minerals being by no means so common in the Fortuna section.

The orebodies are limited on one side by the tuff, but in the andesite the line of division is as a rule poorly marked; instead of being determined by distinct planes the limit is determined rather by the commercial features. In other words, as one passes from the brecciated materials into the fractured andesite, the contents of copper become gradually less and fade out in the more blocky andesite country rock.

The orebodies dip at about 70 deg. towards the center of the crater. Three so far have been worked on: first, the Fortuna, second, the Teniente and third, what is known as the Fortuna No. 4. All of these showed strong outcrops, stained with copper minerals. Besides these strong indications, are others, one to the east of the Teniente main workings, another the Soldado, further to the east and south; and still further south, the Caballeria No. 1 and No. 2, and the Rejimiento, and it is where these indications are shown that future development is planned.

Metallic minerals are iron pyrites, magnetite, chalcopyrite, bornite and secondary chalcocite, a mineral said to resemble tetrahedrite and zinc blende, in the sulphide zone; and in the zone of oxidation, limonite, cuprite, metallic copper and the carbonates and silicates of copper. The principal nonmetallic minerals, outside of the original constituents of the rocks are, tourmaline, quartz, ankerite, calcite, chlorite, sericite, mica, epidote and zircon.

Depth of Profitable Ore

The depth to which the payable orebodies will reach is an important and naturally difficult question to determine with any degree of accuracy. The indications, however, point to a considerable depth—much greater than has been reached at the present time, and will be in the main limited by the compactness of the rock and lack of fracturing, due to the great depth below the original surface at the time of the formation of the orebodies. The difference in elevation between the highest outcrop at Caballeria and No. 4 level, where we have commercial ore, is about 2500 feet.

The Teniente "pipe" which has been followed to between 300 and 400 ft. of the level of Teniente No. 3, showed open channels and indicated great freedom in the passage of the hot solutions. No. 4 Fortuna also shows open texture. However, the few evidences seen are invariably in favor of much greater depth, and as the value of the copper is due to its being mainly in the form of primary minerals, rather than secondary, we do not expect much change in grade, due to increased depth.

It may be said that while chalcocite does occur in the Fortuna, it is limited in amount and apparently occurs as a thin coating on pyrites and chalcopyrite, increasing the grade in a small way.

The Teniente "pipe" represents a different condition, for here there has been secondary action, and the rich bonanzas have been mainly due to secondary cuprite, metallic copper and chalcocite. At greater depth, the lower-grade minerals, chalcopyrite and bornite, will probably be reached, and instead of the bonanza of the upper worked-out portion, there should remain ore carrying bornite and chalcopyrite, but more concentrated than in the case of the Fortuna ore.

The mines have been worked by the Chileans for many years, operations having been carried on in the Teniente mine, and the rich hand-sorted ore either smelted nearby, transported to other Chilean smelteries, or exported. Some concentration was done by means of hand jigs on the richer grades of ore, but no attempt was made to operate on the low-grade ore found in the Fortuna mine.

Orebodies and Present Development

The Fortuna mine was originally opened in the search for rich ore, the strong copper stains of the outcrops leading the original prospectors to hope for high-grade ores similar to those found in Teniente. These prospectors opened up a considerable extent of ground, but reached no great depth, nor did they find much high-grade ore to pay for their labors. Their work, however, showed the American company what to expect, and led it to concentrate its efforts toward the development of this property.

The Fortuna orebody is typical and is represented by a body, lens-shaped in horizontal section, as far as developed about 1500 ft. long, with a maximum width of 260 ft., and of an unknown depth, but so far developed to the No. 4 level, a distance of 1421 ft. below the upper part of this orebody.

The ore lies partly in the fractured andesite and partly in the breccia. At the south end there seems to be a constricted area, where the brecciation and fracturing is less marked. It is hoped that in driving along the contact of the breccia and tuff, conditions may arise favorable to an enlarging of the constricted area into still another body.

The second and third levels have been well developed by the main adits and by numerous crosscuts and stopes. Both levels are being operated.

The No. 3½ Fortuna adit has been driven in as a crosscut to strike the contact of the andesite and tuff, and to drive in under the Fortuna No. 3, in order to strike the ore in depth. Driving is now being done toward the south and west under the Fortuna No. 3. The two levels have been connected by a raise, and the main Fortuna orebody is being developed in the usual manner by crosscuts, drives, raises, etc., on this level.

The No. 3½ Fortuna has struck commercial ore of approximately the average grade of the higher levels. A distance of about 700 ft. had been driven longitudinally in the orebody up to Sept. 1, 1911.

The No. 4 Fortuna adit was driven primarily to strike the contact of the tuff and andesite below certain heavily stained copper outcrops and it was also intended to drive over to the main Fortuna orebody. This crosscut has now been driven to the tuff along the contact in one direction to connect with No. 3 Teniente, and, in the other direction under the main Fortuna orebody. The first has struck ore of excellent grade, and the second has lately cut the main Fortuna orebody below No. 3½, a distance of nearly 400 ft. below the latter. This is further proof that the ore continues to greater depth than heretofore reached.

A connection has been made by means of a raise to No. 3½, so that ore from the No. 2, No. 3 and No. 3½ Fortuna can be dropped into cars on the No. 4, and carried to the main orebins, and in this way it will be possible to do away with several aërial tram lines connected with No. 2 and No. 3 Fortuna, and so centralize all ore transport.

The ore of No. 4 Fortuna orebody occurs in a highly shattered zone of open texture with little or no fine-cementing material. The copper is found mainly in the minerals bornite and chalcopyrite in well developed crystals associated with ankerite and quartz.

The Fortuna No. 4 orebody is now being developed and has shown a length of 55 m. The ore is being raised on and is still continuing at a hight of 42 meters.

The No. 5 Fortuna was started primarily as a working level through which to take ore extracted from the upper levels and carry it to the mill bins. It has been connected with No. 4 level by means of a raise, and a large ore pocket is being constructd. Later it will be driven in to tap the No. 4 Fortuna orebody and the main Fortuna lense. This represents the main ore pocket which will supply ore to the electric railway, running to the coarse orebins at the concentrator.

The Teniente Orebody

The Teniente orebody outcropped in the crater of the old volcano and showed high-grade ore at the surface. The copper occurred in the form of malachite, azurite, chrysocolla, cuprite, metallic copper, bornite, and in the deeper workings, chalcocite. The old prospectors followed the bunches and stringers of ore in the "pipe" and in seams running from the "pipe" to a considerable depth, but were finally driven out by water.

While the "pipe" seems to have narrowed with depth, the ore is still said to continue. At the present time, however, we have not been able to examine this below 150 ft. below the No. 1 Teniente crosscut. Above this the rich ore has been extracted, but there is still some concentrating ore, which it did not pay the old operators to mine. This ore, however, is oxidized and will make a poor product for concentration, and will besides require a good deal of hand sorting. At greater depth, however, the oxidation will decrease and more sulphides appear. The original concentration of high-grade sulphide was further enriched by secondary deposition from descending solutions.

The pipe occuring wholly in the tuff and agglomerate, appears to be rudely shaped like an inverted cone. It has a dip of about 45 deg. northeast from the surface to the adit level; from there steepening to 70 to 80 deg. The ore in the pipe so far mined has been largely secondary and there has been considerable enrichment, due to the leaching of ore higher up and reprecipitation of the leached copper. The constitution of the material in the volcanic "pipe" being a loosely formed agglomerate, has allowed the free passage of solutions and has made possible oxidation at greater depth due to decending waters, as well as easy passage for the original hot ascending solutions.

When the present company took possession of the property, the shaft below the No. 1 adit level was full of water and an attempt was made to unwater this, but without success. Since then, however, the shaft has been drained, probably through the approach of the No. 3 Teniente. Owing to the fact that the shaft was filled to half its depth with débris, the bottom of it has not yet been examined. It is to tap this that the No. 3 Teniente is now being driven, but that adit will also be used to look for ore in the fractured andesite to the east and north of the old workings. A raise of about 300 ft. will be necessary to connect the bottom of the shaft with No. 3 Teniente.

No. 1 Teniente

Driving has been done on this level to get under promising surface indications. Though now a distance of 140 m. below the outcrop, there is still considerable oxidation. The work done, however, has shown ground of a promising character, with assays of over 2.50 per cent., but over most of the distance—150 m.—the copper has been in oxidized forms, unfit for good concentration. As the face gets deeper under the outcrop the proportion of sulphides to oxides and carbonates has increased. It now shows payable ore in the face. This is an extremely promising section and the sulphide zone below should develop commercial ore.

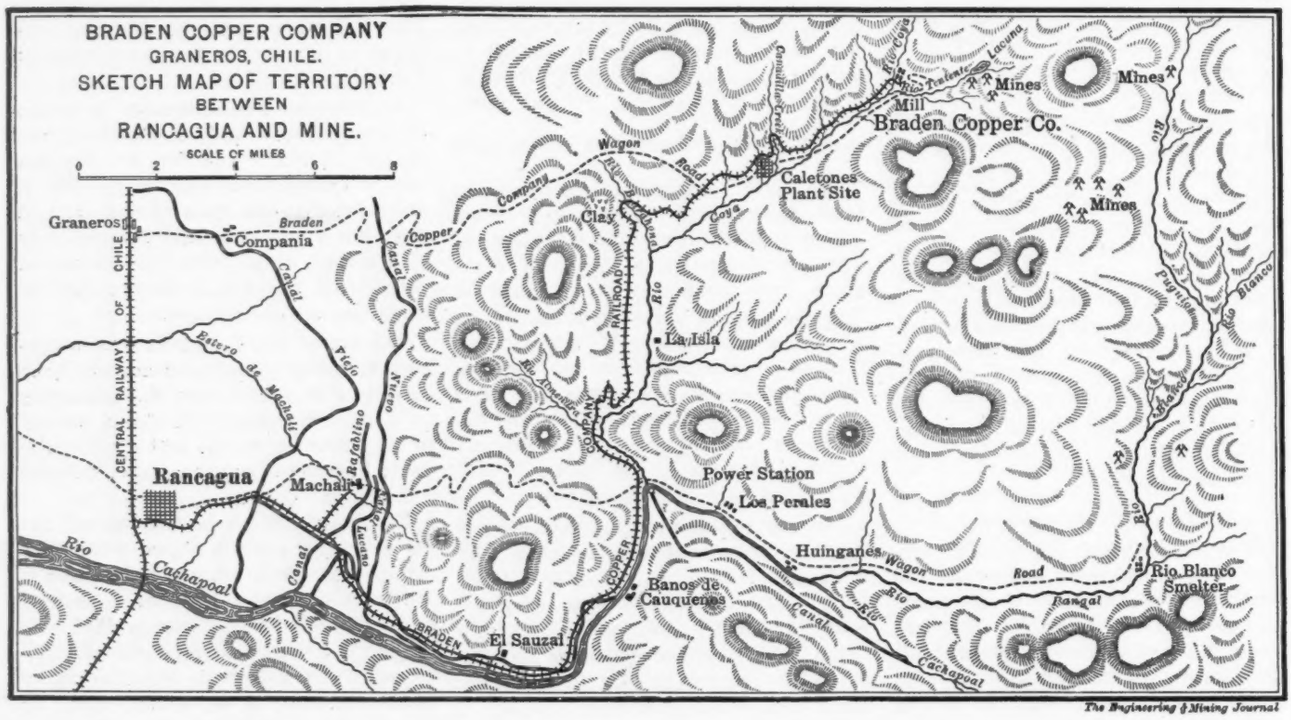
On the level of the No. 1 Teniente a diamond-drill hole was run, showing ore in the fractured andesite of payable quality, and this territory will be more fully prospected later on, both from this level and from No. 3. I may repeat that the surface croppings above this ground are particularly promising.

The No. 3 Teniente adit was driven in primarily to tap the Teniente "pipe" and Teniente shaft, and to prospect the breccia and tuff contact. It has now been driven until it has passed under the shaft and has encountered some ore, but not as yet any extensive body. The main adit has been driven through the contact into tuff. A crosscut is now being driven to the contact between tuff and andesite, below the ore shown in No. 1 Teniente.

Some profitable ore was struck in the fractured andesite at a distance of about 120 m. from the portal of the tunnel. This seems to be in the fractured zone, parallel to the periphery of the crater. The ore here was low grade and apparently not thick. The crosscuts No. 1, No. 2 and No. 3, driven toward the contact, have in each instance struck the tuff-breccia contact, but at points where no ore is shown. The outcrops above these points, however, show no indications of copper, so one should not be disappointed.

While the developments in the Teniente have not been great, except in the old "pipe," from which the best of the ore has been removed, still the evidences for a promising new orebody are most favorable, and the indications are greater here than even in the Fortuna for the disclosure of a valuable and large body of ore.

The total work done represents about 30,000 ft. of driving, raising and sinking. The elevations of the portals of the principal adits are: No. 5 Fortuna, 2273 m.; No. 4 Fortuna, 2361; No. 3½ Fortuna, 2484; No. 3 Fortuna, 2584; No. 2 Fortuna, 2668; No. 3 Teniente, 2392; No. 1 Teniente, 2618 m. There are numerous small adits, shafts and open-



cuts at different points, but the work has not been extensive enough to open up any orebodies.

Soldado and Capitana

The Soldado shows copper-stained croppings to the southeast of the Teniente, and the main adit should be continued around the periphery to below the croppings. Good indications are also shown at the Caballeria No. 1 and No. 2, and on the periphery of the crater, and prospecting at these points is proposed.

It may be of interest to know that it is on the cards to continue No. 2 Fortuna and No. 1 Teniente around the crater, so that the contact will then have been followed at one level or another entirely around the periphery of the crater, a distance of about 2½ miles. Half this distance has already been accomplished. The new work will develop ground below the promising outcrops of Teniente, Soldado, Caballeria Nos. 1 and 2, and Rejimiento.

The Capitana lies without the crater and at a distance from it of about one kilometer. While some copper stain and narrow seams filled with quartz and copper-bearing pyrites in andesite have been found, this does not appear to be in place, as it seems underlain by slide rock.

Mining Methods

For extracting the ore a modified caving system is being employed and in preparing the mine for this work, the stopes are started by the overhand method, the stopes remaining filled with broken ore on which the men work. Pillars are left between the stopes and these will afterward be caved or broken out.

Previously crosscuts were driven at distances of about 17 m., center to center, the center line of the stope being located over them. These stopes had a width of 9 m., leaving a pillar of 8 m. between. The major axis of the stope was at right angles to the contact. Where the lense was not wide, a stope was made, running in the direction of the length of the lense, rather than across it. The ground stands well and breaks well, and no timber is needed, except where box holes are made.

In the past ore from No. 2 and No. 3 Teniente was carried down by two separate aërial tramways to the main loading station, from where it was taken by another aërial tramway to the concentrator. Nos. 4, 3½, 3 and 2 Fortuna are connected by raises and all ore will be dropped down to the No. 4 level and loaded into cars, and from there transported to the ore bins supplying No. 5 level, from which it will be carried direct by electric tramway to the concentrator. The Teniente mine will also connect through No. 3 Teniente, No. 1 crosscut and No. 4 Fortuna with the main ore bin in No. 5 Fortuna.

In the past stoping was done mainly by hand, but it is proposed to carry this on by small hammer drills. Drifting is done by air drills and by hand, but when in full operation, machine drilling will be almost altogether employed. No hoisting of ore will be necessary, as the orebodies can be more easily reached through adits.

Ventilation will also be easy and there should be no trouble on account of water, as all draining will be done through the different adits.

Still greater depths can be reached by tunnels. For instance, a tunnel about 6000 ft. long, driven from a point close to the mill would tap the Fortuna orebody at a depth of between 800 and 900 ft. below No. 4 tunnel, the deepest ore now developed.

Development and Ore Reserves

Development proposed is extensive and consists of driving the following: No. 2 Fortuna to prospect around the periphery of the crater; No. 3½ with numerous crosscuts to open up main Fortuna orebody; No. 4 to open up same and continue to No. 3 Teniente in the other direction; No. 5 to strike main Fortuna No. 4 orebody and open up main Fortuna on lowest level, and No. 1 Teniente around crater to Soldado to prospect upper level; sinking and raising on main Teniente shaft; Teniente No. 3, crosscut from near shaft to contact and to drive along contact to develop favorable ground shown in No. 1; Soldado, prospect by winze, diamond drill or both, and same for Caballeria Nos. 1 and 2, and Rejimiento to be prospected by No. 2 Fortuna.

A careful measurement of the tonnage of ore developed, and the value of the same has been made, and the following is a summary as at July 1, 1911: Main Fortuna orebody, to 30 m. below No. 3, 7,077,986 tons, 2.90 per cent.; additional ore developed by No. 3½ up to June 30, 1911, 2,721,808 tons, 2.70 per cent.; Fortuna No. 4 orebody, 212,312 tons, 3.58 per cent.; Teniente No. 3, 62,510 tons, 2.38 per cent.; total, 10,074,616 tons, 2.85 per cent or, say, 2.70 per cent.

No. 3½, to judge by development already proved on that level and levels above, should open up another two and a half million tons. No. 4 Fortuna has also struck commercial ore below No. 3½, but development has not progressed far enough to allow of estimate of grade. It promises well and will add greatly to the tonnage. The grade so far encountered is commercial, though not so high as the average on account of being on the foot-wall side of the orebody. Roughly, about 1,500,000 tons may be considered as partially developed by No. 4, on Sept. 1, 1911. In determining the results, ore running less than 2 per cent. copper was excluded. It has been figured that ore even as low as 1.50 per cent. will give a profit at 12½c. copper. The density of the ore was determined and 12 cu.ft. in place was found to be equivalent to one ton in weight.

In determining Fortuna No. 3½, 100 ft. below the level was included. For the No. 4 Fortuna orebody allowance for a block of ground extending 50 m. above and 15 m. below the present level was made. No ore is considered as developed in No. 1 Teniente. Teniente No. 3 is all "probable ore." No allowance is made for any ore in the old portion of the Teniente, although undoubtedly considerable will be recovered from the old workings. Nothing, of course, has been considered in connection with the Soldado, Capitana, Caballeria Nos. 1 and 2, or Rejimiento.

Future Ore Possibilities

The future possibilities for ore are most promising—(1) in the direction of new orebodies, indicated in the several copper-stained outcrops around the periphery of the crater; (2) in the promising ground along the contact, close to the old Teniente workings; (3) the most important of all, the continuation of the present developed orebodies, main Fortuna and No. 4 Fortuna to considerable depth. The belief in this continuation is based, first, on the geological features to which the formation of the orebody is due; namely, the formation of the ores from ascending solutions from considerable depth, just after the violent volcanic disturbances; and secondly, to the fact that most of the copper minerals from which the deposits obtain their value are essentially primary, to the extent of their dating back to the original process of silicification and mineralization, accompanying igneous activity. The copper minerals occur more as vein fillings than as replacements of original rocks, and are not dependent upon secondary enrichment from downward percolating solutions, which have leached out the copper minerals at higher horizons and redeposited the copper in mineral form, thereby enriching the poorer primary ores.

It is interesting to note that the ore shown on the second level of the Fortuna is practically of the same assay value as that on the No. 3 level, though the latter is 275 ft. lower than the former; and No. 3½ averages little lower than No. 3, though 328 ft. deeper. Assays for this level so far show an average of 2.56 per cent. No. 4 Fortuna orebody is at a much lower geological horizon, but shows even higher values, due probably more to local conditions than to anything else. The Teniente "pipe" will probably show lower values in depth than in the upper portion, where there is considerable secondary enrichment, due to cuprite, metallic copper and secondary chalcoite. Later developments in No. 3½ and No. 4 Fortuna seem to show an extension of

the ore toward the east, which will bring in an increased tonnage of lower-grade ore. The upraise from No. 4 to No. 3½ has shown a considerable area of low-grade ore extending beyond the main body.

LABORERS' QUARTERS CUT IN ROCK

At the mine, offices, store, quarters for the foreign employees, and for the native workmen, have been erected. The native miners are mostly quartered at the different adits in large rooms, cut out of the country rock, there being no place on which to erect buildings nearby on account of the steep rocky slopes. At the No. 4 level are situated the compressor plant and electric station, operated by power from the Cachapoal power plant, and here also are situated the blacksmith and repair shops.

Supplies have been brought to the mine either by wagon or by aërial tramways and on this latter, the ore is carried to the mill. Later, however, transporting will be done by electric trolley line, run from No. 5 adit to the top of the ore bins at the concentrator, and this trolley line will be connected with the main railway by an incline at the east end of the concentrator. Water for all domestic purposes is obtained from Teniente creek, which is ample for all requirements.

Underground haulage is at present done by means of small cars, either pushed by hand or hauled by horses. Arrangements have been made, however, for electric traction, and electric locomotives and cars are on the ground, and larger electric locomotives are to be employed to transport the ore from the No. 5 adit main ore pockets to the top of the concentrator, over a line about three kilometers long. Owing to the numerous snow slides, it was naturally felt that a surface line would be dangerous, but after looking over the ground carefully, it is believed that the proposed line will be better than aërial trams, but snow sheds have been erected to avoid the danger from delays caused not only by slides, but by drifting snow.

(To be concluded)

Conditions in Spelter

Messrs. L. Vogelstein & Co., New York, write under date of Dec. 2: "The scarcity of spot metal to which we alluded in a recent circular has become acute, the few cars obtainable for prompt delivery commanding a substantial premium. Meanwhile smelters are under constant pressure to expedite shipments of orders already placed. Doubt as to the genuineness of the situation has entirely disappeared and talk of manipulation is no longer heard. In our opinion the scarcity will be found due to several causes, among which may be mentioned: (1) Reduced smelting capacity, (2) The greater quantity of foreign ore smelted in bond for export, (3) The use of western ores with lower zinc contents and poorer recoveries. No. 1 will change as fast as new smelteries can be built. Nos. 2 and 3 depend upon a variety of circumstances, among which may be mentioned the question of gas supply and the interplay of foreign and domestic markets. Joplin ores with higher zinc contents and better recoveries require roasting, hence though more profitable cannot be handled in former large volume. As to smelting in bond there would probably be a diversion from foreign to domestic ores if a continuance of the present large demand and remunerative prices in this country could be counted on; but such unfortunately is not the case, while the foreign demand remains constant and steady operations at fair prices are preferable to the uncertainties of the domestic market."

Placer Gold of Breckenridge, Colorado

The placer gold of the Breckenridge district has considerable resemblance to the lode gold, and much of it, in spite of the wear to which it has been subjected in its travels, shows crystalline structure. Many of the nuggets are clearly more or less battered fragments of leaf or wire gold, although, as would naturally be expected, the nuggets in general are more solid than the specimens of wire gold from the Farncomb Hill veins, as only those pieces having initial coherence and solidity could survive the pounding to which they are subjected by the stream boulders.

From the character of the gold formerly washed from the Farncomb Hill placers, little can now be learned at first hand, according to F. L. Ransome, but the gold appears to have been only slightly worn. Even on the Swan at Snyder's camp, where the gravels are 27 ft. deep, and contain many huge boulders, much of the placer gold retains its leafy or wiry character, although some of the nuggets are well rounded. Among the nuggets seen from these workings on the Mascot placer, were some of the general size and shape of beans, and some flat scales a millimeter or so thick, 5mm. wide, and 15 mm. long. Lower down the Swan the proportion of rounded nuggets increases and gold recognizable as of Farncomb Hill derivation becomes less abundant. The largest nugget found is said to have weighed 29¼ oz. troy, and was dredged from the mouth of Galena gulch. Such large masses, however, are wholly exceptional on the lower Swan, and the dredges now at work would probably lose over the stacker any nugget exceeding an inch in diameter. The placer gold of the lower Swan is about 770 fine.

In the deep placers of French gulch, where dredging is now in progress, the gold is coarse, and nuggets weighing three ounces are fairly common. Many show wiry or crystalline structure. Some have adhering particles of quartz or contain gold embedded in sphalerite. They vary much in shape, but a large proportion are more or less flat or platey, the thickness of many corresponding to the width of the narrow veins in which they once lay. The fineness of the French Creek gold ranges in general from 750 to 760.

The native gold from both the veins and placers of this district, especially those specimens coming from Farncomb hill, are demanded for use in museum and private collections the world over. It is probable that from no locality equally productive has so large a proportion of the gold mined been saved from the melting pot, on account of the beauty and interest of its form[1]. The typical gold from the narrow veins of Farncomb hill occurs as two general varieties locally known as wire gold, and leaf or plate gold. The wire gold is fully as beautiful as the leaf gold, but being more fragile, it is not often secured in as large specimens. It consists generally of a porous mass of curves and intricately felted or tangled crystalline wires, which may individually be three inches or more in length. There are all gradations between coherent spongy masses of felted wires and single filaments, but, as a rule, where the gold occurs in commercial quantity, it is aggregated into masses of considerable size.

The thickness of the masses of leaf or wire gold is generally less than an inch, and, as a rule, nearly, or quite equal the thickness of the vein in which they are found. The gold, however, does not occur in the clean, bright condition familiar in cabinet specimens, but is generally embedded in a reddish earthy matrix, consisting largely of limonite with oxide and carbonate of copper, and various earthy impurities. The vein gold of Farncomb hill varies from 750 to 900 fine, bringing from $15 to $18.50 per oz., or more for exceptional specimens.

Shelby Furnace, at Shelby, Ala., has just completed the reconstruction of its No. 2 stack. The plant now has two 65-ft. stacks, using charcoal for fuel, and running on brown ore mined in the neighborhood. The furnace has been making charcoal iron for 67 years, beginning with a five-ton stone stack built in 1844. The product is used for making car wheels.

[1] "Geology and Ore Deposits of the Breckenridge District, Colorado," Professional Paper 75, U. S. Geol. Surv.

Keeping Mining Costs at Joplin

By Otto Ruhl*

Repeated deficits when lower grade ore was worked have led to more general use of cost-keeping systems in the last three years. Cost records of representative mines are given.

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The production of ore in the Joplin district is sufficiently large to warrant the expectation of carefully kept cost systems, but the relatively small number of operators that keep such a system is one of the surprises to new comers. Of the annual output of $14,000,000 worth of lead and zinc ores it is a safe estimate that not over one-fourth is produced on the basis of a cost-keeping system that allows any semblance of classification and distribution of costs so that the engineer can take up a sheet of the monthly reports of the mine's operations and determine what the mine is doing or have any reliable data upon which to base advice as to the reason for unprofitableness and the points at which remedial action should be applied. "What is your cost of production?" is a question that nine out of every 10 operators will answer with an approximation. More than that, this approximation is more often the result of the questioner's deduction from the operator's statement as to the capacity of his plant and the size of his bank balance, than from any direct assertion of the operator himself.

Tariff Investigation Starts Cost Keeping

Three years ago, conditions were even worse. It was possible to count on the fingers all of the mines that kept a system of costs. Since that time the problems of zinc mining have had considerable influence in causing the mine operators to ascertain just what it was costing to produce ore in this district. Several things have contributed to this growing disposition for improvement. In the first place the producers of zinc ore were pertinently asked during the inquiries of the Ways and Means Committee of the last tariff revision just what their cost of production was and they failed for the most part to be ready with a reply. They had to go to work and compile the data to ascertain the answer, and when ascertained the results were so at variance with what was expected that many operators realized as never before how haphazard had been the mining operations of the field. While everyone dimly realized that labor costs had advanced, that supplies had been on the upward trend, they were unprepared for the showing made which indicated an advance all along the line which more than compensated for the better mining and milling practice that had been developed.

Besides this the change in the character of mining itself, owing to lower grade ore deposits, was not thought to be the factor upon which hung the profitableness of mining. The operators generally had the idea of increased tonnage operations making up for the lower-grade deposits worked. While in a measure true, they had neglected to keep a cost system which would have shown at a glance the limits to which that principle would apply. It was only when the bank balances consistently showed a deficit and stockholders got tired of assessments and demanded to be shown the reason, that the operator himself started out to learn why. Hence the last three years have been largely a readjustment era, an era not yet over by any means, but one in which much has been accomplished in the discovery of what it costs to produce zinc concentrates by systematic methods.

Several Systems in Use

Those operators who blazed the way for the introduction of system in the early days are now distinct representatives of the best mining in the district. Their success has been marked, for they knew whether they were going to be able to make a profit or not. Such companies as the Federated Mining and Milling Company, Oronogo Circle Mining Company, Continental Zinc Company, Grace Zinc Company, Providence Mining and Milling Company, United Zinc and Chemical Company and the American Zinc, Lead and Smelting Company employ detailed cost-keeping systems specially adapted to the conditions under which they are working, among which may be found models for nearly every other mine in the field. As yet there has been no system evolved that will cover the varying conditions of the entire field and hence the variation found in the systems employed. The character of the mine and the scale of operations will always be factors determining details of the system employed. But from these varying systematized records some accurate knowledge is being gained, valuable in the future development of the district.

Labor Cost Largest Item

Taking up any mine costs in the district one finds that the items occur in the following order as to importance: Labor, explosives, fuel, followed by other items in quantities so small as to appear comparatively unimportant. Of the total cost labor exacts from 50 to 60 per cent., explosives from 10 to 25 per cent. and fuel from 5 to 20 per cent. The variation in the explosive cost is due to the character of the mine as well as the efficiency of its use.

DETAILED COSTS OF A SHEET-GROUND MINE, JOPLIN DISTRICT

Week Ended	Nov. 11 Per Ton	Nov. 18 Per Ton	Nov. 25 Per Ton	Dec. 2 Per Ton	Average Per Ton
Labor	0.50080c.	0.46590c.	0.45990c.	0.49600c.	0.47924c.
Explosives	0.21420c.	0.18670c.	0.22780c.	0.22796c.	0.21395c.
Fuel	0.06390c.	0.05979c.	0.06220c.	0.06415c.	0.06220c.
Water	0.01398c.	0.01286c.	0.01380c.	0.01876c.	0.01485c.
Oil	0.01402c.	0.00436c.	0.00756c.	0.00830c.	0.00850c.
Jig grates and supplies	0.01309c.	0.01053c.	0.02089c.	0.02440c.	0.01810c.
Hard iron	.....	0.02573c.	.....	0.01850c.	0.01030c.
Belts	.....	.....	.....	.....	.....
Elevator cups and belts	.....	.....	.....	.....	.....
Other mill expenses	0.03263c.	0.01310c.	0.00815c.	0.00631c.	0.01466c.
Drill repairs and supplies	0.01629c.	0.00763c.	0.01666c.	0.00301c.	0.01095c.
Drill steel	0.01064c.	.....	.....	.....	0.00249c.
Power repairs and supplies	0.00325c.	0.00033c.	0.00123c.	0.00075c.	0.00138c.
Other expenses	0.00650c.	0.00892c.	0.00116c.	0.00783c.	0.00603c.
Casualty insurance	0.02098c.	0.02009c.	0.01932c.	0.02091c.	0.02029c.
Superintendence	0.02798c.	0.02573c.	0.02462c.	0.02681c.	0.02622c.
Management	0.02798c.	0.02573c.	0.02462c.	0.02681c.	0.02622c.
Total	0.96624c.	0.86731c.	0.88791c.	0.95050c.	0.91538c.

The variation of the fuel cost is due to the kind used, gas or coal, and second as to whether gas is used under boilers or in gas engines. Even with a mine combining the minimum percentages there is but a leeway of 30 per cent. to cover the remainder of all the costs, which unimportant in single items, in the aggregate amount to a considerable sum, and may determine the profit or loss of operation.

For the operator who intelligently approaches the problem of starting operations upon a new mine, the determination of his probable costs becomes his first duty and the relative costs of the various items under the conditions surrounding the new property will, when compared with similar conditions elsewhere in the field, fix the matter of profitable or unprofitable operations.

Mucking a Paying Occupation

As labor occupies such an important place in the cost of producing ore, mine operators have given considerable attention to the efficiency problem and to labor-saving devices with a fair modicum of success. Of the labor cost, shoveling or mucking constitutes by far the heaviest item. In this question of shoveling is locked up some pertinent problems, as yet unsolved. In the struggle to increase production the shoveler has presented to the mine operator a decided question mark. In the first place the operator learned that the best results were obtained by piecework, or a certain stipulated sum per can hoisted, a can being usually 800 to 1000 lb. capacity. This system operated to increase the efficiency of the shovelers and stopped a certain amount of loss. But to increase production some stimulus had to be given and gradually the cost per can advanced until today the wage of the shoveler who will work the full week is greater often than the most skilled labor about the mine, and approaches and in some cases exceeds the salary of the superintendent or manager of the mine.

The system thus seems almost to have outgrown its usefulness, for the increased cost has approached the point of overbalancing the efficiency gained. Besides this the greater returns to the shoveler have operated to keep men from becoming proficient machine men, for what is the use of becoming a skilled workman when shoveling yields by far the best wages? Thus to the machine-drill class gravitate those workmen who either lack the ambition to make a large wage or are incapable of reaching up to the average in the shoveling class. Thus the machine drillers are lacking in efficiency, a factor that immediately affects two of the principal items of cost, viz., drilling and explosives. The work done by the operators of the district upon the shoveling problem has been much after the fashion of taking one stone out of a dam to stop a leak, but opening up as large or even a larger leak by so doing.

Labor Demand Unsteady

Complicating this situation to a still greater degree is the fact that owing to the rapid changes and fluctuations in ore prices the mines are not operated steadily and workmen face a constant likelihood of being thrown out of employment, a fact that operates to a maintenance of a high-wage scale at all times and an instantaneous demand for higher wages when ore prices go to high levels. Besides this, large Western mining companies use the Joplin district as a recruiting field for workmen when they inaugurate a nonunion-labor system. This has resulted in taking away from the Joplin district a large number of miners, some of them being among the most efficient.

It is interesting to note the methods employed by the operators in meeting these problems. As production stands paramount in the minds of most operators they have turned to every device that offered an increased tonnage, be it at the same or lower cost. The first-motion hoist has at last come to replace the geared and friction hoists in the field. Where it took three shafts to deliver 300 tons and as many hoists and hoistmen, now the whole amount is obtained from a single shaft or, at most, two shafts. Instead of the old 500- and 750-lb. cans, the 1000- and 1200-lb. cans are now the rule. Instead of having each shoveler push his filled can of ore to the shaft as hitherto, mules drag trains of cars to the shaft. The struggle for capacity is, therefore, carried forward to a much greater point than formerly.

Another feature that has been tried with varying success is the steam shovel for underground work. It was to offset the high cost of shoveling ore and to insure a steady supply of large tonnage that spurred the operators to attempt its use. It cannot be said to have been a great success except in the opencut mines. The American, Continental and Good mining companies all tried forms of shovels for underground work in the Webb City sheet-ground district, but finally abandoned the machines in every case. The trial of one of the machines in an opencut mine at Galena also resulted in the removal and substitution of manual labor. In the Lehigh camp, however, the steam shovel has proved to be highly successful in an opencut mine.

PRODUCTION STATEMENT, SHEET-GROUND MINE, JOPLIN

Week Ended	Nov. 11	Nov. 18	Nov. 25	Dec. 2	Average
Number tons hoisted	1787	1943	2030	1865	7625
Tons milled	1787	1943	2030	1865	7625
Tons Zn ore	49.50	44.00	45.00	39.00	177.50
Tons Pb ore	10.50	6.75	7.00	7.00	31.25
Per cent. Zn recovered	0.02769	0.02263	0.02218	0.02091	0.02328
Per cent. Pb recovered	0.00587	0.00347	0.00347	0.00375	0.00409
Total per cent. recovered	0.03356	0.02610	0.02563	0.02466	0.02737
VALUE AND PROFIT					
Zinc ore	$1845.00	$1804.00	$1845.00	$1599.00	$7093.00
Lead ore	472.50	315.00	315.00	315.00	1417.50
Total	2317.50	2119.00	2160.00	1914.00	8510.50
Royalty (15 per cent.)	347.63	317.85	324.00	287.10	1276.58
Balance	1969.87	1801.15	1836.00	1626.90	7233.92
Total operating	1727.07	1683.91	1798.91	1772.78	6982.67
Profit or loss	242.80	117.24	37.09	145.88	251.25
Net value ton dirt	1.102	0.927	0.905	0.872	0.948
Net profit ton dirt	0.136	0.060	0.083	.....	0.0329
Net value ton ore	32.83	35.50	35.31	35.40	34.65
Net profit ton ore	4.04	2.32	0.713	.....	1.205

Foreign Labor Inadvisable

The substitution of foreign laborers for the American laborer in the district has been agitated by some of the larger companies, but for the present such a course seems unwise. In the first place the American laborer is so much more efficient that any change would entail a revolution of mining and milling practice. Besides the American laborers are jealous of the exceptional conditions here and resent any influx of a foreign element. So far it has been impossible to get foreigners into the field, and it would be a dangerous thing to attempt, both for the company and for the foreigners imported. While the district has always been recognized as a nonunion or unorganized camp, recent years have shown a growing tendency toward some coöperation among miners, and the present year has seen a respectable number of miners organized into a union. Its further growth means increased wages and higher mining costs. Moreover, an attempt to import foreign labor would result in solidifying this union sentiment, a thing producers are fearful about.

Still another method employed more and more by the operators who have felt the struggle on labor costs keenly, has been a contract system for all underground work. The operator will contract with a group of miners to deliver from his ground the required tonnage for the running of his mill. It is seldom, indeed, that the contract is not lived up to by the miner in the terms of tonnage and cheaper underground costs usually result for the operators, but the mine soon becomes a center of attention for the State mine inspector and unless more care is taken the mine is condemned for its unsafe conditions. It is only when contracts are in the nature of piecework directly under the supervision of the mine superintendent that their wisdom can be unquestioned, for only under such a supervision can the proper care of the ground be assured.

Price of Explosives Increased

Explosives have increased in price approximately 20 per cent. in recent years, a serious addition to the cost of mining in a district where dynamite plays a large part in mining operations. Added to this have been the evils brought about by the already mentioned struggle for tonnage capacity. The mill had to have a certain tonnage of broken rock daily, and to insure this tonnage the reckless use of dynamite was encouraged. Where judicious drilling and loading would have resulted in a less cost of explosives per ton, the necessity of meeting a demand

for tonnage caused hasty work and the use of dynamite in much larger quantities. Here at least is one point where the so called new scientific management can find a fertile field for accomplishment. Cost-keeping systems are doing a great deal to remedy conditions, and a wider adoption would greatly assist in minimizing this heavy cost of mining in the Joplin district. In the sheet-ground and disseminated-ore camps especially, would an improvement along this line help, for it is here that the cost of explosives is heaviest and has contributed most to the sentiment against such mining operations.

Fuel Costs

The certainty of withdrawal of gas for fuel under boilers within a short time will make all plants having boilers depend hereafter upon coal. The withdrawal of this fuel for several months of the last year and the raising of the price to 25c. per 1000 cu.ft. whether used under boilers or in the gas engines, has forced the operators to prepare for the change. Some of the operators are putting in gas engines, others are contracting for electric power, while still others are putting in a better type of steam engine and power plants with coal for fuel. All three changes mean decreased power or fuel costs.

Mining supplies in general have advanced slightly during the year, but hard iron, a considerable item in the sheet-ground mills, has decreased, due to a local fight among the foundries. How long this fight will continue cannot be foretold.

Casualty insurance has advanced so strongly during the last three years as to cause many operators to carry their own risks. From 3 per cent. to 4½ per cent. of the weekly pay roll is a big advance and adds from 25 to 50c. per ton of concentrates to the cost of production.

Costs at Representative Mines

Indicative of present practice and the conditions that prevail in the Joplin district are a number of representative mine costs herewith presented. They are representative in the sense that the various kinds of mining, such as soft ground, sheet ground and disseminated ground, are all given. Taken as a class, these mines are better managed, for it is only the better managed mines that have a cost system at all. There are mines with lower costs but they are exceptions, and there are many with higher costs. With the vast majority there is no means of making a comparison, as their systems of cost keeping are too meager to warrant such a term.

Herewith are given in detail a month's costs of ore production in a sheet-ground mine during 1910. The detail is given to show one of the best, if not the best system, now employed in the entire district, as well as the relations of the various items to each other and to the whole cost of production. Shop expense is listed separately simply as a check on the maintenance of that department; the repair work done in the shop is charged directly to departments requiring same, and the individual items include this expense. The system of keeping costs shown by the accompanying tables was devised by B. B. McHan, after a long study of the conditions and needs in the district.

To W. A. Cristy, an operator of long experience in the district and the manager of one of the largest group of mining properties, the district is indebted for the compilation of a series of mining costs on different mines, so arranged as to indicate not only the mining costs alone but the average recovery that will be necessary over a term of years to make the mine profitable. The costs are supplemented with the figures of investment and the conditions surrounding each property mentioned. Taken as a whole they are the most complete mining costs that have ever been made available to the public and are so arranged as to be useful to the prospective operator as well as to those already operating.

DEPARTMENTAL COSTS OF A SHEET-GROUND MINE, JOPLIN DISTRICT

Week Ended	Nov. 11 Per Ton	Nov. 18 Per Ton	Nov. 25 Per Ton	Dec. 2 Per Ton	Average Per Ton
Shop	0.02272c.	0.01560c.	0.01480c.	0.01995c.	0.01812c.
Superintendence	0.02798c.	0.02573c.	0.02465c.	0.02681c.	0.02623c.
General expenses	0.04895c.	0.04581c.	0.04395c.	0.04772c.	0.04650c.
MINING					
Drilling	0.20000c.	0.16221c.	0.16135c.	0.16720c.	0.17200c.
Blasting	0.22580c.	0.19730c.	0.23815c.	0.23910c.	0.22504c.
Shoveling	0.15170c.	0.14540c.	0.14485c.	0.14565c.	0.14670c.
Tracking	0.01670c.	0.01544c.	0.01540c.	0.01729c.	0.01604c.
Tramming	0.02573c.	0.02471c.	0.02960c.	0.03218c.	0.02753c.
Hoisting	0.04170c.	0.03841c.	0.03575c.	0.03889c.	0.03891c.
Timbering	.....	.....	.....	.....	.....
Exploring	.....	.....	.....	.....	.....
Pumping	.....	.....	.....	.....	.....
Power	0.07190c.	0.07260c.	0.06529c.	0.06698c.	0.06881c.
Miscellaneous	0.01165c.	0.00490c.	0.00828c.	0.00426c.	0.00723c.
Total mining	0.74518c.	0.66097c.	0.69867c.	0.71155c.	0.70226c.
MILLING					
Milling	0.09300c.	0.09078c.	0.07140c.	0.09963c.	0.08830c.
Culling	0.01455c.	0.01236c.	0.01709c.	0.01930c.	0.01580c.
Power	0.02503c.	0.02372c.	0.02720c.	0.03181c.	0.02691c.
Miscellaneous	0.01155c.	0.00793c.	0.00495c.	0.01368c.	0.00938c.
Total milling	0.14413c.	0.13480c.	0.12064c.	0.16442c.	0.14039c.
Total per ton	0.96624c.	0.86731c.	0.88791c.	0.95050c.	0.91538c.

Typical Soft-ground Mine

The ore in this soft-ground mine is disseminated through a soft matrix of mud, flint and limestone in the headings but with a hard stope. The drifts are 12 to 14 ft. high. Timbering has to be done carefully. Only a 2-in. pump is used to handle the water. Gas engines supply power for mill and compressor while pumps and hoist are driven with steam. The mill is a 100-ton plant with sludge table. The original investment is: Mill and equipment, $11,000; two 160-ft. shafts, $3200; prospect drilling, $2000; preliminary drifting, $1800; total, $18,000.

The costs here given are the average of a six-month period of operation in which 95 tons per single shift were handled.

SOFT GROUND COSTS

	Per Ton of Ore
Superintendence	$0.021
Surface labor	0.157
Underground labor	0.340
Total labor	$0.518
Explosives	0.049
Timber	0.067
Hardware and supplies	0.098
Fuel gas	0.085
Oil and waste	0.012
Fire insurance	0.005
Liability insurance	0.015
Interest at 6 per cent. on investment	0.026
Total operating expense	$0.875

Figuring the amortization charge on the basis of a three-years operation at 95 tons per day and allowing a price of 40c. on the dollar for the selling of the mill at the end of the time, bring up the charge per ton to $0.159, or a total operating cost of $1.034 without considering the matter of royalty. The matter of profitable operation will, therefore, depend upon the adjustment of the two factors of ore recovery and the royalty. Taking $41.70 as the price of zinc-ore concentrates, the average of the last half-dozen years, it will require ore carrying 2.4 per cent. blende to pay expenses and return investment without the payment of royalty; 2.7 per cent. blende with 10 per cent. royalty and 3 per cent. blende with 20 per cent. royalty. To be profitable the recovery must exceed 3 per cent. and even thus the margin is small.

Typical Disseminated-ore Mine

The ore in the second mine is disseminated in hard flint and limestone. The drifts are 25 to 35 ft. high. No timbering is required. The water is sufficient for a 5-in. pump. Gas-engine drive is used in the mill while steam is employed for compressor, pump and hoist. The mill is a 200-ton plant.

The original investment for this disseminated-ore mine is: Mill and equipment, $14,500; two 180-ft. shafts, $6600; preliminary development, $3000; prospect drilling, $2000; total investment, $26,100.

The costs here given are for a six-month period with an average tonnage of 185 tons per day of 10 hours. The concentrate is blende.

DISSEMINATED-ORE COSTS

	Per Ton of Ore
Superintendence	$0.009
Surface labor	0.147
Underground labor	0.242
Total labor	$0.398
Explosives	0.120
Hard iron and supplies	0.089
Fuel gas	0.124
Oil and waste	0.015
Fire insurance	0.005
Liability insurance	0.014
Interest	0.019
Total operating expense	$0.784

Figuring the amortization at four-years' operation there must be added $0.112 to the above, making $0.896 per ton without considering royalty payments. To pay expenses at 10 per cent. royalty a recovery of 2.5 per cent. blende of 60 per cent. grade must be secured. For 20 per cent. royalty a recovery of 2.8 per cent. is required.

Sheet-ground Costs

The ore is of the sheet-ground type. Drifts are 16 ft. high and no timbering is required. A 5-in. pump is used to handle water. The mill is driven by gas engine as is also the compressor. Hoist and pump are driven by steam. The capacity of the mill is 200 tons. The original investment is: Mill and equipment, $16,500; two shafts, $9800; prospect drilling, $1600; preliminary development, $4000; total, $31,900.

The costs here given are the average of a six-month period of operation in which 203 tons per day were handled.

SHEET-GROUND COSTS—MINE I

	Per Ton of Ore
Superintendence	$0.01
Surface labor	0.176
Underground labor	0.337
Total labor	$0.523
Explosives	0.137
Hardware and supplies	0.162
Fuel gas	0.083
Oil and waste	0.014
Fire insurance	0.004
Liability insurance	0.016
Interest at 6 per cent. on investment	0.019
Total operating expense	$0.958

Figuring amortization charge on the basis of five-years operation at 203 tons per day there must be added to the operating cost $0.101 per ton, making total cost $1.059 without considering royalty payments. To pay expense without paying royalty would require 2.4 per cent. recovery, and with 10 per cent. royalty 2.6 per cent. recovery and 2.9 per cent. recovery with a 20 per cent. royalty. The recoveries must be still larger to insure dividends. In this mine the concentrates are both zinc and lead in the proportion of four of blende to one of lead. The lead is figured at $59.13.

The ore is sheet ground. Drifts are 18 ft. high. No timbering is required, nor any pumping, but there is an added expense of $60 per month to pay for water to use in the mill. The mill is driven by a gas engine. The expense of the gas-driven air compressor is divided with a neighboring mill. The mill handles 200 tons: Original investment: Mill and equipment, $12,500; two shafts, $8600; prospect drilling, $1800; preliminary development, $4500; total, $27,400.

BREAKING COST—SUPPLIES—SHEET-GROUND MINE, JOPLIN

Week Ended	Nov. 11	Nov. 18	Nov. 25	Dec. 2	Average
Total sticks powder	.....	.....	6,808	7,452	.....
Number sticks shooting	5,647	5,935	5,296	5,650	22,528
Number sticks squibbing	.....	.....	1,512	1,802	.....
Number holes	186	192	165	195	738
Number feet	1,471	1,544	1,328	1,522	5,865
Average depth holes	7.91	8.04	8.05	7.81	7.95
Sticks, hole squibbing	.....	.....	9.16	9.24	.....
Sticks, hole shooting	30.38	30.90	32.09	28.98	30.51
Total sticks per hole	30.38	30.90	41.25	38.22	35.19
Sticks, ton shooting	3.160	3.052	2.61	3.03	2.958
Sticks, ton squibbing	.....	.....	0.744	0.966	.....
Total sticks per ton	.....	.....	3.354	3.986	.....
Tons per hole	9.61	10.12	12.31	9.56	10.34

BREAKING COST—LABOR—SHEET-GROUND MINE, JOPLIN

Week Ended	Nov. 7	Nov. 18	Nov. 25	Dec. 2	Average
Hours mill run	58	56	61	58	233
Tons per hour	30.80	34.70	33.29	32.18	32.73
Shifts Underground					
Machine men	52	54	53	54	213
Backers	52	54	53	54	213
Shovelers	80	86½	86½	82½	335½
All others	65	60	64	65	254
Total underground	249	254½	256½	255½	1,015½
Surface Men					
Mill men	45½	46½	48	49	189
Other top men	60	59½	59½	60	239
Total shifts	354½	360⅝	364	364½	1443
Tons per shift					
Per drill	34.38	35.98	38.30	34.53	35.80
Per shoveler	22.34	22.52	23.48	22.61	22.75
Per underground man	7.18	7.64	7.91	7.30	7.51
Per man	5.04	5.39	5.58	5.12	5.29

The costs here given are the average of six months in which 179 tons of ore were handled daily.

SHEET-GROUND COSTS—MINE II

	Per Ton of Ore
Superintendence	$0.012
Surface labor	0.160
Underground labor	0.330
Total labor	$0.502
Explosives	0.131
Hard iron and supplies	0.120
Fuel gas	0.073
Oil and waste	0.012
Fire insurance	0.004
Liability insurance	0.017
Interest at 6 per cent. original investment	0.017
Total operating expense	$0.876

Figuring the amortization charge on the basis of five years at 179 tons per day makes it necessary to add to the operating cost $0.106 to return the investment, which makes the total cost $0.982. To pay expenses at 10 per cent. royalty a recovery of 2.4 per cent. must be made and with 20 per cent. royalty 2.7 per cent. must be made. In this mine the concentrates are two tons of blende to one of lead.

Sintering Iron Ores

The American Ore Reclamation Company is maintaining a testing plant at its works in Birdsboro, Penn., where tests on the sintering of iron ores are made without cost to those intending to investigate the process. About 10 bbl. of ore are usually sufficient for a test. The process embodies the Dwight-Lloyd system and is intended to treat low-grade iron ores, producing a material suitable for the blast furnace.

The system is automatic and continuous, the output in the case of magnetites averaging about 100 tons per day for each machine. The working costs are embraced in power, fuel intermixed with ore, labor, repairs and royalty. The resultant product is a sintered cellular mass, presenting an exceptionally large surface to the blast-furnaces gases and an increased output over compact lump ore. The results obtained in the treatment of flue dust have been highly satisfactory. In the Adirondack and Lake Champlain districts are low-grade iron-ore deposits which, it is expected, may be treated profitably with this process. Samples of sintered ore and flue dust may be seen at the office of the company, room 1908, 71 Broadway, New York.

Placer Mining in Colombia

By R. D. O. Johnson*

Placers have been worked continuously since the Spanish conquest by primitive methods. Dredging promises to yield bulk of gold in future. The rich "playas," only slightly worked until recently, are being subjected to hydraulicking.

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Springing from a confused mass of the Andes mountains at the southern border of Ecuador, containing the volcanoes, Sangay and Cotopaxi, three divergent ranges extend in a northerly direction through Colombia. These are known as the Western, Central and Eastern Cordilleras. At the point of junction, these ranges have an elevation of from 14,000 to 16,000 ft. above sea level. The Western and Central Cordilleras diminish in elevation as they extend northward and finally sink into the alluvial plains of the Magdalena and Cauca rivers. The Eastern Cordilleras extend to the coast and include, near their northern end, some of the highest peaks in Colombia.

Three Mountain Ranges

The area between the Eastern Cordilleras and the west coast includes two great river systems, the Atrato on the west and the Magdalena in the central and northern parts. The Atrato river lies between the Western Cordilleras and the west coast. The Magdalena drains the area between the Eastern and Central Cordilleras, and the Cauca river, its principal tributary, lies between the Central and Western Cordilleras.

The territory lying to the east and southeast of the Eastern Cordilleras is drained by the Amazon and the Orinoco rivers. Little is known of this region and, so far, it has no economic importance. The southern, central and western parts of Colombia are exceedingly rugged and mountainous; the northern parts are low and flat, the delta region of the Magdalena and Cauca rivers.

This information may be gained by an inspection of any good map of Colombia, but is important to such observations as I was able to make in the state of Antioquia, to which region my travels were largely confined.

The area of Antioquia covers the branching and expanded northern ends of the Western and Central Cordilleras and extends north to the delta region. The topography is rugged in the extreme, but to one used to the naked angularity of the Rockies this fact is not at first apparent, due to the softening effect upon the landscape of the dense growth of tropical vegetation with which the Andes are clothed. But traveling on mule back over the Andean trails soon dispels any illusions that, at first, he may have entertained and brings forcibly to his mind the fact that though the angularity and steepness may be masked, they are present none the less. The inexperienced traveler in Colombia has to learn that 20 to 25 miles per day is about as far as a mule can travel and keep at it. The restless American with a desire to get his work done and done quickly learns to take matters easier after a few trips at the ends of which he has found it necessary to walk and drive his exhausted mule.

The precipitation is heavy, the streams are numerous and torrential. The Cauca river itself, with the exception of a part extending about 50 miles above the city of Antioquia, is a roaring mountain torrent from its source to the town of Cáceres, at the edge of the alluvial plain. Opposite the city of Antioquia, the Cauca is broad, shallow and turbid, probably 700 feet in width. A few miles below the mountains close in, the grade of the river bed increases and the stream narrows to 150 ft. Within a distance of 45 miles below the city of Antioquia, the river receives the waters of about 100 creeks and of three small rivers, yet the grade and current have so greatly increased in this distance that the river discharges its waters through a channel not over 100 ft. in width.

Large Rivers Navigable

Both the Magdalena and the Cauca, in fact all the larger streams, carry great quantities of silt, evidence of intense action of the erosive agencies. The Magdalena river is navigable from its mouth to Honda, a distance of 500 miles, and is the principal artery of commerce to the interior. In Antioquia, the land lying between the river and the foothills of the mountains more or less level or gently rolling, is from 15 to 30 miles in width and is known as the "hot country." The Cauca is navigable as far as Cáceres and, at times, as far as Valdivia. The low countries are greatly favored over the interior mountainous regions in the matter of transportation and communication with the coast.

Knowledge of Geology Limited

The geology of the country has received but little study from competent geologists. What is to be learned from their writings is meager and fragmentary. F. Linwood Garrison makes the following observations[1]: "The axis of the Western Cordilleras appears to be chiefly composed of eruptive rocks having an andesitic or porphyritic character. This backbone is flanked on both sides by rocks of a distinctly pre-Cambrian type. Upon the gneisses, granites and schists of this formation are sedimentary rocks of the Triassic or Jurassic and, probably in the district we are now considering (lower Cauca), some Cretaceous."

On my travels in Antioquia, I have seen no sedimentaries with the exception of recent gravels, clays and alluvials. The axial cores of the several ranges I have crossed I found to be invariably syenitic granite. The high percentage of feldspar the granites contain has rendered them much more susceptible to weathering and erosive agencies than the flanking gneisses and schists. As a result of the differential rate of erosive action, the schistose formations are now topographically much higher than the granite cores and constitute the mountain ranges. The granite underlies the valleys between. The schists dip away on all sides from the eroded granite cores. Between Sonson and Narino I saw several cores of pure syenite. This rock has shown greater resistance to weathering and erosion than have the schists and gneisses that lie upon the flanks. The syenite stands high above them, showing the dome-like outline of the higher points characteristic of the weathering of this rock.

Granites and Schists Prevail

The granite is light gray and is composed of white feldspar, hornblende, biotite and a small percentage of quartz. I would say the proportion of feldspar is as high as 70 per cent., though it varies greatly in different places. The granite weathers into spheroidal masses that are reduced in diameter as the weathering proceeds, leaving shells of less altered granite in the surrounding detritus.

The larger streams, with the exception of the Cauca river, appear to pass over granite as a bedrock. Garrison states that this river probably occupies a synclinal trough in the schist between the Central and Western Cordilleras. My observation confirms this conclusion. As far as I saw the Cauca its channel was in schist seamed and laced by many intrusive dikes of andesite. Many of the minor irregularities of the course of this river are due to the greater hardness and resistance to erosion possessed by these dikes. I have seen but few andesite intrusions in the granite.

In the broad valley in which are situated the towns of Rio Negro, Carmen and

[1]"Gold Mining in Colombia," *Min. and Sci. Press*, Feb. 6, 1909.

La Ceja, are extensive beds of kaolin and other clays. The kaolin is white, exceedingly plastic and apparently of excellent quality. These clays are clearly the result of the weathering of the granite. The topography of the regions underlain by granite is flatter and much less irregular than that of the schist regions. The soil is fertile and is extensively cultivated. The soil of the schist regions is thin and of low fertility.

Schists Contain Pyrite

The schists are greatly folded and contorted and cut by many faults and andesite dikes. Both the schists and the andesite contain notable quantities of pyrite. This is manifest not only by inspection but by the presence of many chalybeate springs issuing from the schists and from the sides of the dikes. This leaching of the pyrite is responsible for the coatings of iron oxide to be found in the adjacent gravels and the contained gold. Assays of the andesite show 50 to 75c. per ton in gold. Gold freed by the oxidation of pyrite must be in such a fine state of division as not to be recoverable in placers unless it undergoes some process of solution and redeposition on the coarser particles of gold or pyrite contained in the gravels. This theory of the deposition of gold in placers is ably supported by J. C. F. Johnson[2].

The schist contains a large proportion of quartz in thin veins and lenses. These lenses are often to be found in shear zones, in series following and overlapping one another, but always conforming in shape and position with the foliations of the schist. I saw no quartz veins cutting the formation, though andesite dikes cut the formation in every direction. Some of this quartz will show free gold, but I know of no place where these lenses are rich enough to pay for working. The great quantities of this low-grade quartz the eroded schist must have contained would seem to be sufficient as a source of the gold in the placers of Colombia.

Torrents Cause Deep Erosion

Most of the mountainous parts of the country are schist. The small streams flowing over this rock are for the most part torrential in character, falls, cascades and short riffles succeeding one another until the plains are reached. The heavy grades of these streams are responsible for such heavy and rapid erosion of their channels that they lie at the bottoms of deep and narrow cañons. The sides of these cañons stand at such high angles and the slopes are being undermined so rapidly that landslides are of frequent occurrence. From an elevated point in the mountains, I have counted as many as 20 paths or chutes, old and new, from which the loose rock, earth and the forest covering had descended into the streams below.

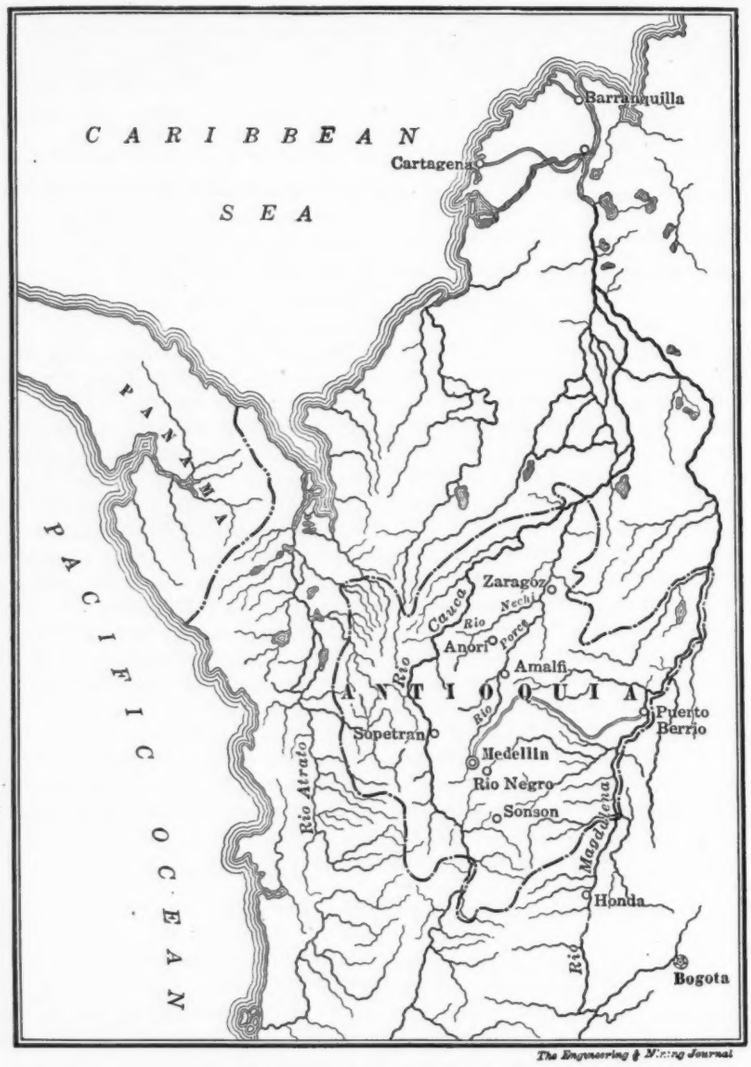
[2]"Getting Gold," second edition, pp. 48-58.

So dense is the vegetation that the only places where the underlying schist is exposed to view are either near the stream beds or these landslide chutes. I visited a point on the Santo Domingo river where, shortly before my arrival, there had occurred an unusually large landslide. It was evident from the denudation of the vegetation from the side of the cañon opposite to that on which the slide descended, that the amount of material precipitated into the valley had been sufficient to dam the river to a hight of 100 ft. At the time of my arrival all of this material, save a few large masses of schist, had been washed out.

Rock Pulverized in Pot Holes

Great quantities of partly decomposed schist with its gold-bearing quartz are precipitated into these torrential streams only to be swept down and pulverized in the pot holes that lie at the foot of every fall. These pot holes are efficient grinding mills. During flood periods, and they cover the greater part of the wet seasons, the material contained in these pot holes is in a constant state of circulation. That the motion is of a rotary character is evinced by the form of the holes; though the sides may be neither straight nor vertical, any cross-section will be found to be nearly circular in form. The bottoms are invariably higher in the center, showing the greater wear at the periphery.

The gravel and pebbles in these holes are loosely disposed, never packed tightly, and contain but little gold, though the riffles and broad places in the streams may have yielded large quantities of gold. That the gold enters these pot-hole mills is beyond question, but that it does not remain is equally certain. Like the schist and quartz, it is worn and ground into dust to be carried out by the turbulent waters and deposited in the level and quiescent reaches of the larger streams. With this multitude of mills running to their full capacity during a great part of the year, what wonder is it that the waters of the Magdalena and the Cauca are



Map of Antioquia, Colombia

charged with silt and that whole states lie within the limits of their deltas?

Most Small Streams Contain Gold

One important point that bears directly upon the matter of the great extent and probable value of the low dredging grounds is that almost without exception the small streams are or have been gold bearing. I have seen evidences of ancient placer-mining operations on every creek I have examined, and I am informed that the creek that has not yielded gold is the exception.

These torrential streams fed by the rains and snows of the high sierras offer unlimited opportunity for the development of electric power in every part of the country. Those who contemplate entering into dredging enterprises in Colombia will not fail to note the important element of cheap power and its bearing on the successful exploitation of the dredging grounds.

On the head waters of the Santo Domingo river, a few leagues from the town of Mesopotamia, are heavily bedded deposits of quartzite. These beds or strata are tilted to high angles, crushed and contorted, but always conformable with the foliations of the inclosing schist. At many points these quartzites are mineralized along the contact with the schist and are the object of a considerable amount of native mining, the individual operations being conducted on a small scale. The mineralization fades out from the contact and the gold-bearing solutions do not seem to have penetrated beyond a distance of two feet. Small spots of great richness and containing coarse gold are sometimes found, but ordinarily the gold is exceedingly fine. The sands from the native mills from this and other parts of the country yield readily to cyaniding with high extraction. Handsome returns have been the reward of American enterprise in reworking some of these sands. The tailings from most of the native mills have, however, been allowed to escape into neighboring streams and are lost.

Remnants of Ancient Gravels on Plateaus

On the higher plateaus, particularly near Santa Rosa and Rio Negro, are remnants of what appears to have been an extensive stratum of ancient gravels. It is probable that the high gravels near Anori and Amalfi are parts of the same deposit. Around Rio Negro, these remnants are thin and patchy but near Santa Rosa they cover great areas and attain to a depth of 60 ft. in places. The gravels are quartz and quartzite, the pebbles small and so greatly worn as to be almost spherical in form. The appearance is strongly suggestive of beach gravels.

These gravels contain much clay, probably the decomposed remnants of the porphyritic and andesitic pebbles the the beds formerly contained. The heavy beds or *cerros* of this gravel near Santa Rosa have been the object of extensive placer-mining operations in the past, though work on them has long since ceased. Ground sluicing and washing with the batea were the methods employed. All of these gravels are said to contain gold, though my investigations showed such a low tenor as to put them in the unworkable class.

If these gravels covered the area over which their remnants are now to be found and attained to the thickness shown in the *cerros* near Santa Rosa, the aggregate bulk of the deposit must have been enormous. Even with a low content the total amount of gold contained must have been so considerable as to constitute one of the important sources of the gold Colombia has produced and that is now contained in the low-lying placers.

Later Gravels in Valley

Another series of ancient gravels, but belonging to a much later period, occupies the valley region about the cities San Jeronimo, Sopetran, Antioquia, Sucre and Liborino. These gravels were undoubtedly deposited by the Cauca river. As the river eroded its channel below Liborino, the gravels were successively deposited and cut out, leaving evidence of this process in a series of seven or eight benches or *cerros*, the topmost of which lies at an elevation of more than 300 ft. above the present level of the river. These gravels all contain gold but are too lean for profitable working.

On a trip down the river from a point above the city of Antioquia to within a short distance of Valdivia, I saw many benches of gravel of all ages and all carrying some gold. At many points the later gravels had been extensively washed by the natives. This is true of every point I have visited in Colombia, the later the gravels the more completely they have been turned over.

Placers Worked from Early Times

This is an old country in a historical sense. The placers have been worked continuously since the Spanish conquest. There is abundant evidence that the native Indians were well acquainted with the art of placer mining and practised it long before the Spaniards came. Since the conquest, Colombia has added over $700,000,000 to the world's stock of gold, more than has been produced by any other South American country, Brazil included. This was all produced by crude and primitive methods but these have been continuously pursued for over 300 years.

As a result there is but little ground left that could be made to yield by these processes. The people are poor and are content with small returns. A search for high gravels, suitably disposed for hydraulicking and containing enough gold to make their mining profitable is almost hopeless. But there exists a large and important class of placer deposits that were so certainly beyond the reach of the Spaniard and the Indian and the primitive methods they employed, that, though they knew these deposits to be probably the best and richest the country afforded, they did not take the trouble to acquire property rights in them by the easy and inexpensive process of denouncement.

Playas are Richest Deposits

These are the low-lying water-filled *playas* or river-bottom lands. Some of these placers were attacked by the Spaniards. In some instances crude water-wheel-driven cane pumps aided by numerous hand pumps were sufficient to clear the pits of water and to allow the bedrock to be cleaned. These water-wheels were skilfully made. They were from 18 to 25 ft. in diameter and were so connected that from four to eight pumps could be driven from one wheel.

The pumps were added as the growing influx of the water in the pit made them necessary. As a result of this policy, the capacity of the pumping plant was not much greater than the actual needs at any one time. A flood in the river of sufficient hight to cover the *playas* or a breakdown on the part of the pump rigging with the consequent filling of the pit was a serious matter and frequently resulted in the complete abandonment of the enterprise. This kind of mining was quite properly regarded as hazardous for small capital and was, of course, undertaken only after the more accessible deposits had been exhausted.

The pits were made square. The dimensions at the surface were usually about 18 to 20 ft. They were started as large as possible as the methods of timbering employed contracted the area with each set. At a depth of 25 ft. the area of the bedrock exposed would be about one-half, or less, the area of the pit at the surface. Pits were sunk at places thought to promise the greatest yield, but generally the preferred situation was the part of the *playa* near the hillside as far from the river as it was possible to place them. These pits when successfully worked served more to prospect the ground than to mine the precious metals.

Americans Introduce Hydraulicking

This was the condition of placer mining in Colombia until a few years ago, when some enterprising Americans put in a hydraulic-elevator plant on the Porce river. This first plant was followed by others. The *playas* of this river are now known to be rich but exceedingly spotted, the gold occurring in narrow streaks and channels. Furthermore, these *playas* are well suited for hydraulicking with the aid of elevators.

However, the pioneers in these enterprises were unpracticed in the art, unacquainted with the difficulties of getting a ditch to stay on an unstable mountainside and had no knowledge of the occurrence of the paystreaks. The net results were a few successes but more disheartening failures. The last year has witnessed a marked change in affairs on the Porce. With reorganizations and, in some instances, reëquipment and a better knowledge of the difficulties to be overcome, brilliant successes have been scored where dismal failure had been the reward of former efforts.

The *playas* of the Porce are a series of river-bottom lands, the river winding through them in broad sinuous curves. Between the *playas* the river breaks into falls and cascades, so that the *playas* are disposed in elevation in a series of low steps. The bedrock is soft, decomposed granite, flat or gently rolling, varying in depth below the surface between 12 and 40 ft. A few spheroidal boulders of disintegration are left scattered on it. The pay gravel varies greatly in thickness and is generally overlain with barren sand topped with sandy loam or silt.

The disposition of the *playas* and the structure of the river valley in general are characteristic of a number of medium-sized tributaries of the larger rivers. The conditions do not favor dredging. The workable parts of the *playas* are small, 20 to 60 acres, and the *playas* are separated by such falls and cascades in the river as to effectually prevent the floating of dredges from one *playa* to another. The conditions are, however, favorable for hydraulicking with the use of elevators. Water under high pressure can be brought to most of the *playas* by comparatively short ditches and short pipe lines.

Profitable Field for Dredging

The great bulk of the gold the future will credit to the account of Colombia will be produced by the dredging areas of the low countries. These extensive and promising regions lie awaiting American enterprise. The advent of the Oroville Dredging Company at Zaragoza is epochal in the history of Colombian placer mining. The success achieved by this company in California is the best assurance that the "Oroville people know their business." They are advised by able and cautious engineers. They have undertaken the work of preparation and equipping in that spirit and with that sureness of movement that spells success.

Mr. Garrison very aptly sums up the history of previous attempts at dredging in this country in the following paragraph: "A number of dredging enterprises have been exploited in Colombia that have been dismal failures; dredging contraptions that could not possibly be made to pay even in the best of California's fields have been thought good enough for Colombia; men absolutely without experience in any kind of mining enterprises have been put in charge of operations in this country, a place where honesty, prudence, experience and a resourceful character are prime requisites in a successful manager."

False Idea of Climate

Deserved failures have been condoned by disappointed investors by condemning the government, the people and the climate of Colombia. The matter of climate has been particularly urged against investment in this country. Colombia has probably as many varieties of climate as are to be found in the United States, though these varieties for any particular region are constant or with but little variation throughout the year. The climate of the high plateau is cool, uncomfortably so; at an elevation of 5000 ft. above sea level, the climate is delightful. With lessening elevation the average temperature increases until the low countries are reached, where the climate is similar to that of Panama, where the Americans have learned the art of living in comfort. The art is a matter of eating, dressing and housing, and paying regard to the elementary laws of hygiene and sanitation.

Up to the time the "deadly Isthmus" was robbed of its terrors and Panama converted into a health resort, there were many and excellent reasons for the white man's shunning the low tropical countries. The "deadly climate" is a stock expression and time-worn argument that has been used effectually in dispelling tentative notions of entering into enterprises in Colombia. Panama has taught that the "deadly climate" is but another name for "deadly ignorance." The debt that all tropical countries owe to Colonel Gorgas and his crew of valiant assistants is incalculable. He took the theories of tropical sanitation and reduced them to practice.

It is a mistake to assume, as many do, that natives living in a malarious country are immune from fever. I have lived for months among them when many about me were ill from fever, but by following a few rules derived from the teaching of Colonel Gorgas, I escaped sickness and came out with health unimpaired. The teachings of Panama seem not to have been lost on the managers of the Yuba Construction Company at Zaragoza. This company is building the dams and erecting the electric plant and dredges for the Oroville Dredging Company. I am informed that they are solving effectively the problems of preserving the health and working qualities of their employees. With this notable example before them, engineers need no longer regard the climate as an insuperable obstacle to recommending the prosecution of enterprises in low tropical countries.

Colombia Favorably Situated

Colombia is but little known in the United States and has received but little attention from American capital, yet, of all the South American states, it is the nearest and most accessible. In point of distance, Medellin, the capital of the state of Antioquia and situated in its center, is no farther from New York City than is San Francisco, Cal. By virtue of the great Magdalena and Atrato rivers and their navigable tributaries, Colombia possesses channels of cheap and easy access for hundreds of miles into the interior. No other South American state is so fortunately provided. It is probable that 90 per cent. of the promising dredging grounds can be reached directly by navigable streams. At many points on the Magdalena, Cauca and Atrato rivers, the steam boats can tie up alongside the dredging grounds.

Though it appears that "government by revolution" is still more or less to be expected, the periods of peace between these political paroxysms are growing longer. The opinion generally entertained in the United States as to the stress and general disturbance of business during the political revolutions is greatly exaggerated. I have talked with several Americans who were engaged in mining operations during the last revolution. They stated that about all the inconveniences they suffered during the period were shortage of labor and delayed and sometimes interrupted communication with the coast. Their property remained undisturbed and their property rights suffered nothing.

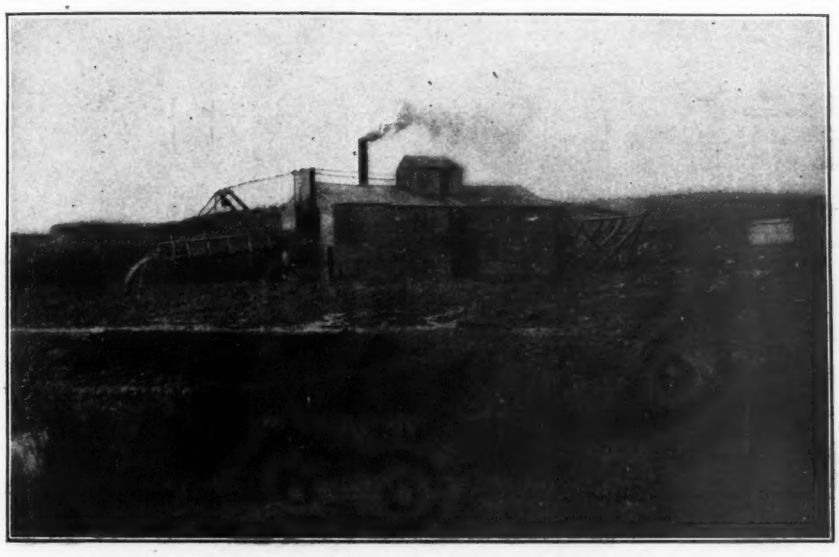
The attitude of the people toward Americans and American enterprises is friendly in spite of a general feeling of resentment that is entertained against the United States Government for its action in connection with the Panama revolution.

Cheap Labor Available

Labor is cheap and abundant. The peons are willing workers and are easily managed. Though less efficient than American labor and requiring much more supervision, work can be done here equally well and at a cost of from 25 to 50 per cent. cheaper than the same work could be done in the United States. The peon costs his employer for wages and food less than 60c. per day, and for this amount he labors 12 hours. Capable native foremen are rare. Executive ability, even in a moderate degree, is not a quality of the peon.

The condition of the placer-mining industry in Colombia today is similar in many respects to that which existed in California previous to the advent of the dredges. The production of alluvial gold has fallen from its former proportions to $2,500,000 per year. This is, of course, due to the exhaustion of the higher and relatively less important

placer deposits of the creeks and smaller streams. Probably the most reliable estimate of the production of gold in Colombia is to be found in a book published in 1886 by Vicente Restrepo, entitled "A Study of the Gold and Silver Mines of Colombia." According to this authority, the production of gold and silver since the Spanish conquest up to 1886 was $672,000,000, of which $639,000,000 was gold and $33,000,000 silver. The annual production since 1886 up to date would bring the total to $700,000,000 in gold alone. Of this great total the state of Antioquia is credited with having produced one-half and the state of Cauca nearly the same amount. Doctor Soetbeer is authority for the statement that the gold production of Colombia between 1537 and 1875 was $850,000,000. Other authorities have placed the figure at $1,000,000,000. It is probable that Restrepo's estimate is most to be relied upon.



MYSTERY FLAT DREDGE WORKING UPHILL IN NEW ZEALAND

Since 1848 California has produced $1,400,000,000; since 1851 Australia, including Victoria and West Australia, $2,710,000,000; Russia and Siberia, $1,300,000,000, and South Africa, $1,000,000,000. Though Colombia's production measures up to the best, the comparisons are largely unfair to Colombia. In all of these great gold-producing countries the yield has been accomplished largely with the aid of modern machinery and the best equipment that highly trained engineers backed by ample capital have been able to devise.

Colombia has had none of these aids. Her great yield, exceeding that of any other South American state, has been accomplished through the agency of primitive methods and crude appliances. The most important of these is the wooden batea. The results are certainly remarkable, yet it is inconceivable that any large part of the total quantity of the alluvials could have been worked by these methods. The greater part lies along the Atrato, Magdalena and Cauca rivers awaiting modern enterprise, brains and money to put Colombia into the front rank of the great gold-producing countries.

Dredging at Waikaia, New Zealand

BY A. GORDON MACDONALD*

The southern province of Otago, in New Zealand, may be fittingly termed the birthplace of modern dredging practice, and at present dredging has settled down to almost the status of an industry. Under such circumstances, new methods and improvements in various directions are to be expected.

The Mystery Flat Gold Dredging Company, operating in the Waikaia dredging district, is carrying out a rather novel method of working by means of which ground, hitherto considered available only for sluicing purposes, is being treated by the dredge.

After dredging all the available river flat, the dredge is now working its way up the gentle slopes of the terraces and foothills surrounding the river flat. To do this, water has been brought on to the claim by means of a race about two or three miles long, and at an elevation of about 50 ft. above the river level. The dredge works in a "paddock" supplied by this race, and continually stacks its tailings behind, forming a dam to keep up the level of the water in the paddock. As the ground is shallow, a tailings elevator is not required, the dirt being passed through a sluice box, as shown in the illustration.

When first attacking the slopes, it was found that the tailings dam would not rise with the rise of the ground until a low dam was first built to hold the bulk of the tailings. Once started in this manner, the tailings keep building an efficient retaining wall for the paddock. These low dams of sod and brush will probably have to be built up occasionally as the dredge advances and rises.

At present the dredge is about 30 ft. above the river level, and it is the intention of those in charge to work right up to the water race. After reaching that level, pumping will be necessary to keep the paddock full, for the scheme is, if possible, to work over a low saddle at an elevation of about 50 ft. above the level of the water race, and so into another gully down which the dredge will work its way to the river again.

From the progress already made by the dredge, it would appear that this method of working is quite successful, and though in this case it is intended to rise only about 100 ft., there is no reason why this method should not be used for even greater hights, and so making available ground so far considered unworkable, owing to the lack of water under pressure for sluicing. At all events, the immediate future of this dredge will be watched with interest.

*Invercargill, New Zealand.

Ore Treatment at Moose Mountain, Ltd.

A contract has recently been made between the American Grondal Company and the Moose Mountain, Ltd., licensing the latter to operate a plant for wet magnetic concentration and briquetting of magnetite ores under the Grondal patents, in connection with its mining operations in Hutton township, district of Nipissing, Ont. For some time past the Moose Mountain company has conducted, both in Europe and the United States, an investigation of the treatment of ores of this type.

A plant with a nominal capacity of about 375 tons per day of finished material is now in course of construction at Sellwood, Ont., and is expected to be in operation during the season of 1912. The construction work is in charge of the company's superintendent, F. A. Jordan. Alexander Laughlin & Co., of Pittsburg, are the construction engineers and have retained Hamilton & Hansell, of New York, as consulting engineers regarding features of the plant directly affecting the Grondal process.

The product from the Grondal plant will be in the form of briquets containing 63 per cent. metallic iron and about 0.02 per cent. phosphorus. The Moose Mountain company has available a large tonnage of ore that may be utilized by concentration, and in the event of the commercial success of the plant now in course of construction, the productive capacity will be greatly increased.

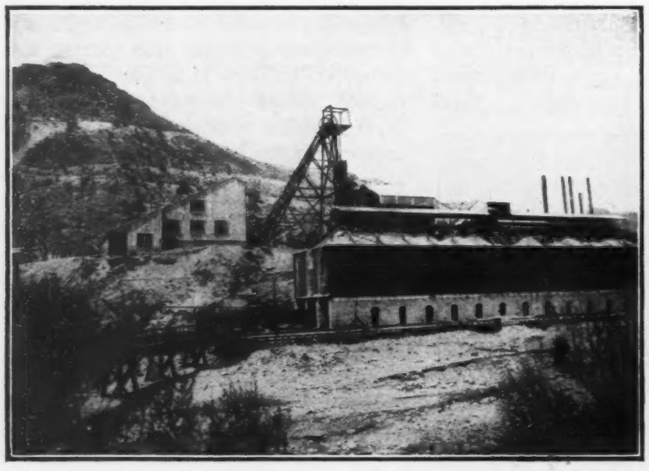
Ore Handling at Ray, Arizona

By C. L. Edholm *

Description of the mechanical-handling appliances at the Ray mines. Auxiliary ore pockets in shaft hold just one skip load. Thirty railroad cars load at once from the storage bins.

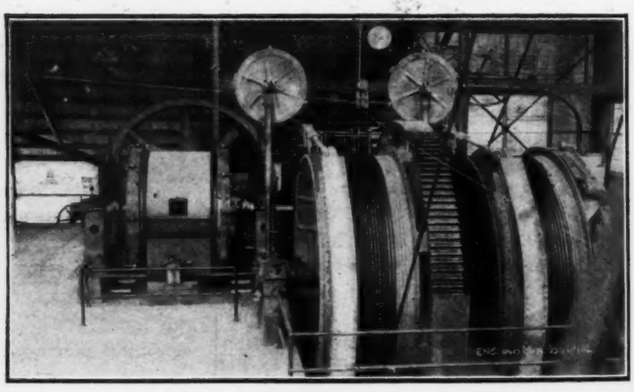
*4624 Figueroa street, Los Angeles, Cal.

One of the big copper centers of the Southwest is now being developed by the Ray Consolidated Copper Company, which has installed some new ore-handing devices in connection with its modern equipment, to solve the problem of making low-grade ores pay dividends. This company has an orebody 800 ft. wide, 6000 ft. long, of a blanket form, which ranges in depth from 80 ft. to upward of 300 ft. This immense mass of ore runs about 2.17 per cent. copper, being a disseminated chalcocite, or copper glance, in Pinal schist. In order to produce the red metal at a profit, it has been found necessary to cut down labor charges by the use of automatic devices, which represent the last word in economical handling of ore.



SHAFT NO. 1, AND ORE-STORAGE BINS

SHAFT NO. 2, WITH CANTILEVER HEADFRAME



THE 72-IN. GARFIELD ROLLS AND THE ELECTRIC HOIST AT RAY CONSOLIDATED SHAFT NO. 1

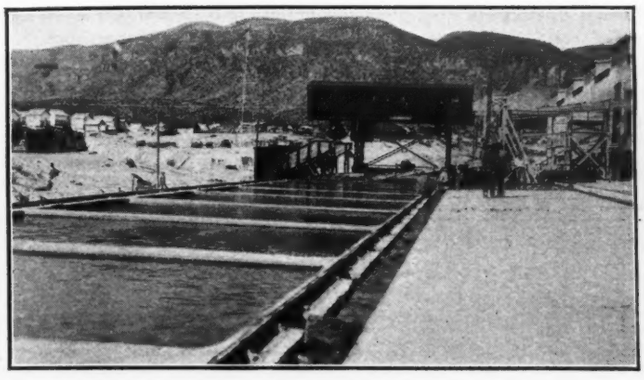
SHAFT EQUIPMENT

Shaft No. 1 is equipped with double-drum electric hoist, connected by rope transmissions to the gear shaft of the hoist and without the usual flywheel set employed in electric hoisting. The ore is hoisted from pockets on the various shaft levels by 12-ton Kimberley skips, which discharge automatically into the ore bins of the crusher house, adjoining the shaft headframe. These ore bins are so arranged that the automatic gates deliver the ore over grizzlies to McCully crushers. The crushed ore is then screened, the oversize going to 72-in. crushing rolls, while the undersize is transferred by conveyer belts to the main loading bins.

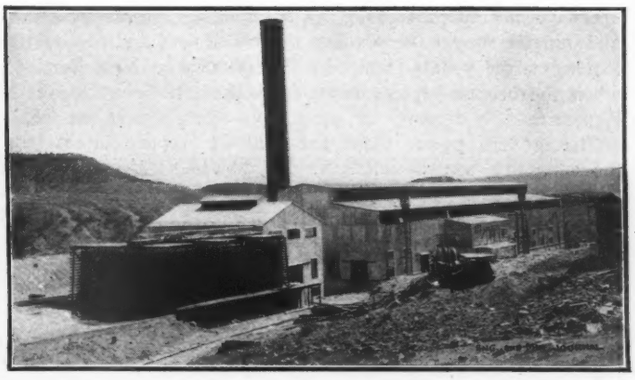
These huge bins have a capacity of approximately 35,000 tons and the ore is distributed evenly over them by a movable and reversible conveyer belt, about one-half the length of the bin structure. The bins discharge directly into railroad cars, as three tracks run beneath them, each track having a capacity of 10 cars, so that 30 cars can be loaded at one time by this method. As tests have indicated a capacity of 10,000 tons per day production from shaft No. 1, it will be seen that the loading system must be rapid and efficient to keep the bins clear. The foundation of the largest bin consists of four walls of reinforced concrete. They support a floor of I-beams and concrete, while the walls of the bin are of steel.

The devices in the shaft are no less modern and effective. In shaft No. 1 the main loading pockets discharge their ore into auxiliary pockets which contain one skip load. The gates, both of the main pocket and auxiliary pocket, are so arranged that the latter is automatically locked while the pocket is being filled with ore, thus preventing any accidental discharge of ore into the shaft. The skips are loaded quickly after landing, the operator at the pocket using the time during which the skip is being hoisted for

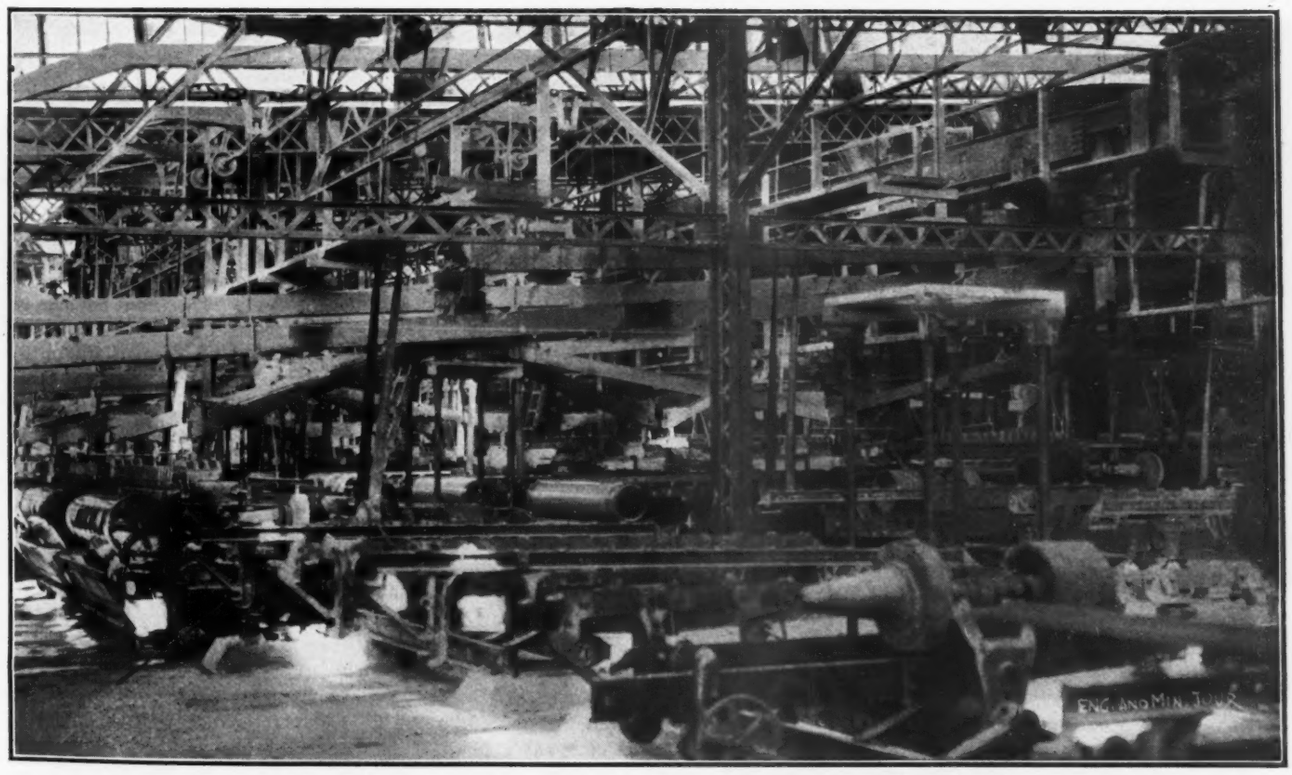
RAY CONSOLIDATED MILL AT HAYDEN, ARIZONA



RAY CONSOLIDATED CONCENTRATE BINS



POWER PLANT, HAYDEN, ARIZ.



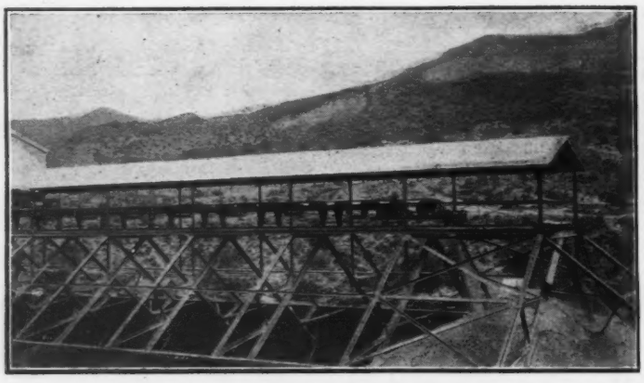
UPPER VANNER FLOOR AT RAY CONSOLIDATED MILL

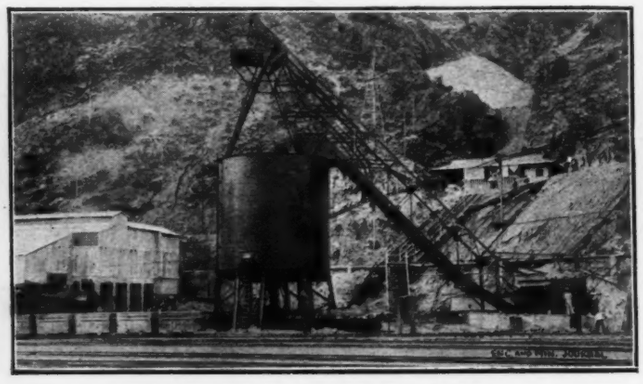
filling the auxiliary pocket with the required amount of ore, closing its gates, etc. A unique feature of these gates is that they open downward, hence their operation is simple and easy.

Special Headframe for Handling Waste

As the removal of waste would interfere with the rapid handling of the ore, a special headframe has been erected at shaft No. 1 for disposal of the barren rock. This headframe is of the cantilever type and is an unusual construction. Automatic skips receive the waste at the various levels of the mine and discharge directly into a circular steel bin alongside the railroad track, whence it is quickly loaded into cars and switched to the waste dump. Little waste is handled here, however, as the workings are in a large orebody, the method being to cut long and narrow stopes at regular intervals, leaving wide pillars which will crush when the broken ore is drawn from the stopes.

The modern power plant and mill of the company are situated at Hayden.





Ore-distributing Device and Cantilever Headframe for Handling Waste at Ray, Ariz.

The latter is now handling 4000 tons of ore per day, and here, too, the most efficient methods of handling material have been adopted. The concentrate drainage bins are equipped with a traveling crane and effective loading device that discharges into the railroad cars direct.

New Smeltery near Hayden

A smeltery is now in the course of erection between Hayden and Winkelman, to be operated as a custom plant by the American Smelting and Refining Company. As work is being rushed upon the plant, it is expected that by April, 1912, it will be handling 500 tons per day and, when all units are installed, will have a capacity of 2500 tons per day. The plant will consist of two and perhaps three 500-ton water-jacketed blast furnaces, and five or more reverberatories, each having a daily capacity of about 300 tons, together with a complete equipment of converters. The most important feature in connection with the installation of the great modern plants thus briefly described, is the development of one of the richest copper centers of the Southwest, which has heretofore been handicapped by totally inadequate facilities for marketing ore to advantage. Negotiations are now in progress for connection by railroad with the Imperial copper mines, at Silverbell, the Calumet & Copper Creek mines (which have been extensively developed in spite of previous adverse conditions) and the Globe district through the San Carlos box cañon. In addition to a number of developed mines, there are excellent prospects in the district which may now be more readily developed.

Colorado Fuel and Iron Company

This company owns and operates iron-ore and coal mines in Colorado, Wyoming and New Mexico; iron and steel works in Colorado. It has the only large steel works in the Rocky Mountain region. The report for the year ended June 30, 1911, shows capital liabilities of $34,235,500 common stock, $2,000,000 preferred stock and $20,816,000 funded debt.

The production statement for the year is as follows, in short tons:

	1909-10	1910-11	Changes
Coal mined	4,722,832	4,233,756	D. 489,076
Coke made	905,599	753,192	D. 152,407
Iron ore mined	879,630	841,699	D. 37,931
Limestone	407,517	425,704	I. 18,187
Pig iron made	385,602	397,701	I. 12,099
Finished iron and steel	412,749	424,421	I. 11,672

The income account for the year is as follows:

	Iron Dep't	Fuel Dep't	Total
Earnings	$13,775,664	$9,159,022	$22,934,686
Expenses	11,273,097	8,183,239	19,456,336
Net	$ 2,502,567	$ 975,783	$ 3,478,350
Interest, etc., received			671,599
Total			$ 4,149,949
Fixed charges and taxes			$ 2,306,395
Sinking funds and miscellaneous			583,881
Total charges			$ 2,890,276
Surplus for the year			$ 1,259,673

The disposition of the coal mined in 1910-11 was: Used at company's plant, 622,711 tons; used in making coke, 1,272,294 tons; sold, 2,338,751 tons. The coal used at the coke plants shows an average of 1.69 tons per ton of coke made.

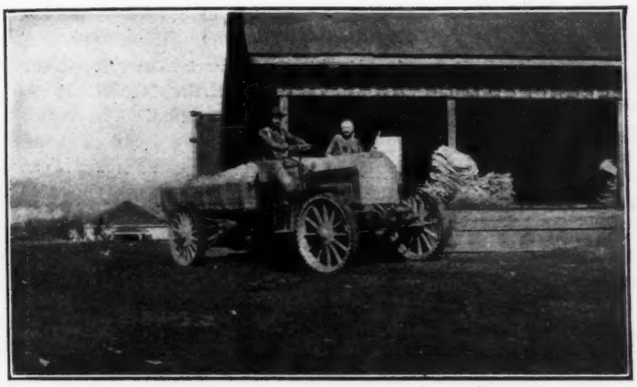
Miscellaneous charges include $233,602 for the sociological department and for personal injuries. Compared with the previous year there were decreases of $705,128 in gross earnings; of $440,862 in expenses, and of $264,266 in net earnings.

The president's report says: "The year commenced with promise of better coal business than had previously been enjoyed by the company, but an unusually mild winter and the extreme drought in the agricultural States west of the Missouri river during the season 1911 caused a lighter demand for Colorado domestic coal in the first half of that calendar year than has been known in a similar period in the last decade, with the result that the coal production fell off 489,076 tons, and earnings from fuel sales decreased $274,692. This decrease in earnings would have been overcome by the more efficient management that ruled in both the producing and selling divisions of the fuel department but for the disastrous coal-mine explosions that occurred in January, 1910, and October, 1910, most of the expense of which was borne by last year's business, and all of which had been paid and charged to operating expenses prior to July 1, 1911. The iron department shows an increase of $170,832 in gross, and $10,430 in net earnings, with prices on all products except rails much lower than for many years. Had the higher prices of the previous year been secured, the net earnings from the sale of iron and steel would have shown an increase of at least $250,000, due to the lower costs of ore and steel. It may, therefore, be said that, considering the unfavorable conditions, which the management could neither have foreseen nor prevented, the results from the year's operations were more favorable than in any previous year of the company's history. The expenditures for maintenance have been on as liberal a basis as heretofore, and the physical condition of the property has been improved during the year."

Motor Truck for Mines

By Rex Beresford*

The mine freighter with his six-mule team, his creaking wagon and jingling traces and his unlimited supply of effort-inspiring conversation, has long been one of the most picturesque figures of the West or of any place where mining and mine freighting is done. Sometimes even the still slower and louder-creaking ox wagons have been utilized for the purpose. All sorts of freight outfits have been tried, for the transportation problem was, and is, one of the biggest that has to be solved before many mines can be profitably worked. Supplies of all sorts, have to be freighted in as well as the ore or mine product freighted out. This gives employment to many men and teams but is costly. Teams and equipment, wagons, feed and drivers' wages are high. Roads are none too good. Hauls are long and, of necessity, much of the hauling done is of feed and often even water for the freight teams.



Motor Truck with 7900-lb. Load at the App Mine, California

In spite of the drivers' skill, accidents happen on lonely mountain or desert roads.

Like the free range and the cowboy, the old freighters and their outfits are now starting to be replaced by newer methods.

At Jamestown, Cal., W. E. Brooker uses a three-ton truck with perforated cast-steel-rim wheels and wood-plug tires for hauling gold-bearing concentrates from three mines to the depot at Jamestown. His truck delivers 35 tons of the sacked concentrates per day, which is five tons more than the 4 four-horse teams which formerly did the freighting were able to accomplish. This truck is working over mountain roads on grades of from 10 to 23 per cent. While his truck is rated at three tons, Mr. Brooker has often hauled much larger loads. One of the accompanying illustrations shows a 7900-lb. load hauled from the App mine to Jamestown, a distance of three and a half miles, in 40 min. Mr. Brooker has no trouble in starting or stopping or handling his machine in any way on the mountain road.

The old-time freighters' investment was too great in proportion to the result obtained. The cost of feed which must be shipped and freighted in or raised on expensive irrigated land and the large investment in horses, wagons and harness, makes team hauling too expensive. A fair estimate of the cost of equipment necessary in the case cited would be about as follows: 16 horses at $150, $2400; 4 wagons at $60, $240, and 8 sets of harness at $45, $360; total investment, $3000. The truck's cost in the above case was $2500. The cost of operation is also greatly in favor of the truck.

At least four men are required to handle the teams. Feed, wages, stable room, shoeing bills and repair bills, all are high. With the motor truck there is only the cost of gasolene and lubricating oil and the wages of one, or not more than two men. Of course, there are occasional repair bills and at times the truck may even balk, but the repair bills are no higher than with wagons. Moreover, a horse sometimes dies or runs amuck and smashes things. The motor truck stands without hitching, and is ready to go when needed. The operating cost as compared with that of freighting with teams is low.

Another point in favor of the motor truck over horse hauling is that heat or cold makes no difference to the truck, while the teams are susceptible to heat troubles especially. Hot days make no difference to the truck. Just as many trips with just as big loads can be made with the thermometer at 99 or higher as when it stands at 40 or 60 degrees.

Motor trucks are in use doing all sorts of hauling and freighting about mines and quarries in all sorts of places. George H. Koster, of Jamestown, Cal., uses his truck for general mine freighting, hauling poles for mine timbers, oil for the mines and all sorts of supplies. M. H. M. Power, East Auburn, Cal., uses a three-ton truck for hauling lime from Alabaster Cave to New Castle, a distance of seven miles. The Ellis Park Crushed Stone Company uses a three-ton truck pulling trailers for hauling crushed limestone, delivering it for building and contracting work. There are also trucks hauling coal from mines in Canada and Montana, and doing all sorts of freighting about those mines.

*Engineer, Avery Company, Peoria, Ill.

Generation of Halogen Cyanide

A recent invention of Hans Foersterling (U. S. pat. 999,215), which he has assigned to Roessler & Hasslacher Chemical Company, relates to a method of generating halogen cyanide in connection with an oxidizing agent.

The method proposed for forming bromocyanide, for example, is as follows: Sodium bromide is melted with sodium cyanide in the proportion of one molecule of each and the mixture permitted to solidify. The inventor claims that no decomposition takes place during this process. In order to convert this double salt of sodium bromide and sodium cyanide into bromocyanide, an oxidizing agent, such as hydrogen peroxide, is added, the reaction taking place according to the following equation:

$$NaBr + NaCN + H_2O_2 + H_2SO_4 = BrCN + Na_2SO_4 + 2\,H_2O.$$

If an acid solution were not used, sodium hydrate would be formed, which would destroy the bromocyanide, according to the following equation:

$$BrCN + 2\,NaOH = NaBr + NaCNO + H_2O.$$

In practice it is proposed to furnish the ready-made correctly proportioned mixture of alkali halogen with the cyanide, so that it will only require the addition of an oxidizing agent to prepare for use.

The value of the slate produced in the United States in 1910, according to the U. S. Geological Survey, was $6,236,759, an increase of $795,341 over 1909. Ten States contributed to the output, Pennsylvania and Vermont being the heaviest producers.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. W. Merrill, of San Francisco, is visiting in New York.

C. W. Purington announces that he has opened a branch office at 42 Moika, St. Petersburg, Russia.

Lewis E. Aubury, late State mineralogist of California, has established his headquarters at Burlingame, California.

John W. Callinan, who has been largely interested in Porcupine, Ontario, since the camp was started, has gone to Mexico to engage in mining.

Cornelius F. Kelly, of Butte, Mont., has been elected a vice-president of the Anaconda Copper Mining Company, succeeding the late F. P. Addicks.

F. W. Denton, general manager of the Copper Range Consolidated Company, has returned to Painesdale, Mich., from a business visit to New York.

J. W. Mercer, who has been making a long trip through British Columbia and Alberta, is now in Colorado, expecting to return to New York before the holidays.

Prof. Newton H. Winchell addressed the Geological Club of the University of Minnesota, Nov. 23, on the work of the Minnesota Geological and Natural History Survey.

Thomas Kiddie, of Vancouver, B. C., is spending a winter vacation with his son, John Kiddie, who is on the engineering staff of the Arizona Copper Company, at Morenci, Arizona.

Frank C. Greene, of Cleveland, Ohio, is now general manager for the Graham Island (B. C.) Coal and Timber Syndicate, Ltd., which holds coal lands on the Queen Charlotte group, British Columbia.

T. H. Wilson, chairman, Harry von Berg and J. Hancke, all of London, directors of the Tyee Copper Company, have been visiting that company's offices and property on Vancouver island, British Columbia.

Robert H. Stewart, general manager of the Consolidated Mining and Smelting Company of Canada, Ltd., returned to his headquarters at Trail, B. C., early in November, after having spent a month in Ontario and Eastern Canada.

W. H. Trewartha-James, of Victoria, B. C., has resigned as general manager of the Tyee Copper Company, and W. J. Watson, superintendent of the company's smeltery, at Ladysmith, Vancouver island, has been appointed acting manager.

Frank H. Probert, of Los Angeles, Cal., and his chief assistant, Mr. Wanvig, have gone to Guanajuato, Mexico, where they will be engaged in the interests of the Proprietary Mines Company. They will be away from Los Angeles about four weeks.

Anthony J. McMillan, liquidator of the Le Roi Mining Company, Ltd., has gone to London, after having spent several weeks in British Columbia and Washington, in connection with the disposal of that company's mining and smelting properties.

Hon. Richard McBride, premier and minister of mines for British Columbia, was in New York recently, on his return from an official visit to Ottawa. He went hence to New Orleans, where he was entertained by Mayor Behrman, after which he returned direct to Victoria.

F. H. N. Gerwig, assistant superintendent of the Carrie furnaces of the Carnegie Steel Company, has resigned to become superintendent of blast furnaces of the Pittsburgh Steel Company, Monessen, Penn., and will look after the erection of the new blast furnaces to be erected there.

H. H. Claudet, formerly of Rossland, B. C., who has been supervising experiments with one unit of the Elmore vacuum-process plant on ore from the Hewitt-Lorna Doone mines, near Silverton, is now superintendent of the Wakefield concentrating mill, Four-mile creek, for the Silverton mines.

N. H. Emmons has resigned as general manager of the Tennessee Copper Company, and opened an office as consulting engineer at No. 921 Temple avenue, Knoxville, Tenn., on Dec. 1. Mr. Emmons has been with the Tennessee company over four years, and has been in entire charge of the operations for nearly three years.

Frank C. Elmore, of London, has been spending several weeks in British Columbia in connection with the experimental application of the Elmore vacuum process of concentration to local ores. Experiments are in progress at the Wakefield mill, near Silverton, Slocan lake, on jig middlings from lead-zinc ore, and at Britannia Beach, near Vancouver city, on copper ore.

Robert H. Leach, of Britannia Beach, Howe Sound, B. C., has resigned the position of vice-president and general manager of the Britannia Mining and Smelting Company, Ltd., which is controlled by Grant B. Schley, of New York, and associates. J. W. D. Moodie, of Salt Lake City, Utah, general manager of the Tintic Mining and Development Company, and the Yampa Smelting Company, succeeds Mr. Leach at the Britannia.

OBITUARY

Walter Simonds Franklin died at Baltimore, Dec. 3, aged 76 years. He graduated from the Lawrence Scientific School of Harvard University, and after serving several years in the Army as an engineer, he settled in Baltimore. He was for several years manager of the Ashland Coal and Iron Company, and later of the Maryland Steel Company; and was connected with several other enterprises.

SOCIETIES and TECHNICAL SCHOOLS

Colorado Scientific Society—The headquarters of this society have been moved to 418 Boston building, Denver.

University of Illinois—Dr. C. P. Steinmetz recently delivered two lectures before the engineering students of the university. The subjects were "Unexplored Fields in Engineering" and "The Nature of Electrical Energy."

American Institute of Mining Engineers—A Spokane local of the American Institute has been formed with Prof. R. S. McCaffrey, of Moscow, Idaho, as chairman; G. A. Collins, Spokane, vice-chairman; L. K. Armstrong, Spokane, secretary-treasurer. These and Prof. F. A. Thomson, Pullman, Wash., and James F. McCarthy, Wallace, Idaho, are the executive committee. There are nearly 100 members in the Spokane local, which covers a territory embraced in eastern Washington, northern Idaho, northeastern Oregon, extreme northwestern Montana and southern British Columbia east of the Cascade mountains. The following-named papers were read and discussed at the first meeting: "North Washington Power and Reduction Company's Cyanide Plant at Republic, Wash.," by H. W. Newton. "Geology of the Silver Bell District, Arizona," by C. A. Stewart.

Four regular meetings will be held each year with such intermediate meetings as the executive committee may decide upon. These meetings will probably be held at different points in the section.

Cripple Creek District Mining and Metallurgical Society—The November meeting was held Nov. 21. After the paper of the evening, "Notes on Mine Accounts," by T. H. Sheldon, of the Portland mine, the meeting was opened for general discussion; among the topics discussed, other than the subject of the evening, were the establishment of a mine-rescue station at the Portland mine, the progress of the Roosevelt drainage tunnel and its probable effect upon the district, modern stoping drills, and the recent Federal injunction in the high-grading cases. This society was organized last spring, for the immediate purpose of providing rescue stations and training crews for fighting underground fires and combating bad air; from that start it has developed into a scientific society for the discussion of problems met with in the mining and metallurgical practice of the camp, and for the purpose of bringing the operating staffs of the mines and mills into closer touch with each other. The officers are P. H. Argall, president; Fred Jones, secretary; D. L. McCarthy, treasurer.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

Dec. 1—The reopening of old mines in various parts of California has been a constant attraction to capital in the present year, and while this activity has not in all instances been marked by large investments, there is an apparently prosperous future for this class of mine operations. It is true that some of the old and prosperous mines have been worked out, but they were, in most instances, of shallow depth and of free-milling character. The history of California mining discloses that in many districts where former large and profitable production of quartz ores has been discontinued, or the development of pay ore in profitable measure has failed, the cause was largely due to excessive costs entailed by crude methods of both extraction and treatment of the ores, or to lack of economic installation of surface improvements. The Forbestown district, situated 22 miles east of Oroville in Butte county, and extending south into Yuba, to which attention is just now being directed, presents a fair illustration of both these conditions. There are four groups of claims, known as the Burlington, Shakespear, Miller and Gold Bank, situated in the heart of the district, all of which have been productive, but for several years idle, until recently.

The combined production of these mines approximated $2,000,000. In the years of this productiveness there were other producers, both quartz and placer mines, in the district, and Forbestown was one of the prosperous camps of the State. Then, in apparently the hight of prosperity, the bottom dropped out of the camp, and it came to be one of the many deserted villages, as far as mining activity counted; today there is an impression extant that the mines were all worked out and that there can be no further profitable operation of them. Careful study of the geology of the district and the mineralogical character of the ores recently extracted or remaining in sight underground goes a long way toward destroying this impression of a worked-out camp, and even casual observation of the early methods employed discloses in a large measure the cause for the desertion of a camp that gave promise of long life. In one instance large bodies of ore were extracted and milled, without regard to development of the remaining orebodies for future extraction, and with apparent disregard for economic mining. In another there was evidence of careful exploitation and economic development, but lack of employment of the best methods even then available for the treatment of the ores; while in still another instance the same careful underground work was done and a modern mill installed, but the method of transportation was of the crudest and most expensive that could have been conceived, next to wheelbarrow movement. And in one of the most important claims in the district only surface prospecting was done, which has since been shown by small expenditure in development work to indicate the presence of considerable bodies of ore.

The vein on the Burlington has been shown to extend north and south for a length of 5000 ft. along the course of the claims; in the Shakespear there is a parallel vein for a length of 4200 ft., and in the Gold Bank the vein is continuous for 4000 ft. east and west. In the active operation of the camp there was a 60-stamp mill running for 17 years and a 10-stamp mill for about half that time. These are the evidences of the former prosperity of the camp and the recent examinations that have been made by mining engineers have induced present activity which, if it be persistent, should put the camp again on its feet. The history of this is the history of many other districts. A detail description of the several mines and claims in the district will be worth more when the development in progress shall disclose more clearly the character and extent of the orebodies. Meanwhile the operators active at Forbestown are showing their faith by their work.

Denver

Dec. 2—The Colorado Grubstake and Mining Company was organized on Nov. 25, and Charles A. Johnson, president of the Chamber of Commerce, was elected president; Philip Argall, vice-president, and Thomas Tonge, secretary. The mining engineers on the board of directors are Henry C. Beeler and Ernest Le Neve Foster. On the advisory committtee are Prof. R. D. George, of the State University, State geologist, and Dr. Victor C. Alderson, chief of the State School of Mines, at Golden. The capital stock of the company is 250,000 shares of a par value of $1. All officers serve without salary, and funds accruing from the sale of stock at par, will be used as working capital to develop the prospects discovered last summer by the prospectors sent out by the Grubstake committee of the Chamber of Commerce.

Labor troubles at the coal mines reached an acute stage on Nov. 28, when a nonunion mineworker at the Industrial mine of the Rocky Mountain Fuel Company, was shot and killed by the night marshall at Superior. The following day a pitched battle between union and nonunion men was averted only by prompt action of the authorities and prominent business men. It is feared that the trouble is not yet over.

The question of extending the deep-drainage tunnel is now being considered, and whether to drive the main heading or to continue driving on the C. K. & N. vein, of the El Paso company, from the Fuller crosscut, and from which three-fourths of the present flow of 800 gal. per min. is coming. The argument against this is that the management should not go on developing El Paso ground; the argument for it is that the two tunnels driven prior to this one, developed all the water and drained a large part of the district from the C. K. & N. vein. The present tunnel heading is in red granite and the breccia area of Raven hill has not yet been reached, at which contact a larger body of water might be developed.

Butte

Dec. 1—As announced last week, instructions have been received by the Butte, Anaconda & Pacific railroad to make immediate preparations for extending the road from Anaconda to the Georgetown mining district, a distance of about 22 miles. A survey of the route to be used was made recently by Charles Lemmon, engineer, and providing that the right-of-way can be secured reasonably, it will be built west from its present terminus, the lime quarries six miles west of Anaconda, up Warm Springs creek, over to Silver lake, and thence to Georgetown, at a cost estimated at about $1,500,000. Mining men interested in this region have been endeavoring for many years to have a railroad built into this district, as there are at least 18 mines there, carrying large bodies of low-grade ore, which have been compelled to cease operations on account of the high cost of transporting the ore by wagons to the Washoe smeltery. With the road in operation, nearly all of these mines can be worked profitably and it will undoubtedly mean the opening of many new mines. In addition to the proposed extension, new and heavier steel is being laid between Butte and Anaconda.

The reduction works at Basin, Mont., the property of the La France Copper Company, in which F. A. Heinze is interested, was recently sold by the sheriff on a claim of the State Savings Bank at Butte, but it has been redeemed and is again the property of the La France company. A part of the plant is being used by the Butte & Superior company on a lease which will expire next summer, about the time that it expects to have the new concentrator ready for operation. W. A. Clark recently had an examination of the plant made with a view of securing it for the treatment of zinc ore from the Elm Orlu mine, and although negotiations were under way for the plant by Mr. Clark, they have since been abandoned, for the present at any rate. Also a proposition to merge the Butte & Superior and Clark zinc-mining interests was considered and dropped. Senator Clark is at present having tests made of some of his zinc ore in Germany by a new process which, if successful, may result in his building a plant in Butte embodying the principles of the German process.

Salt Lake City

Dec. 1—The campaign for the building of State roads is being rapidly advanced. It is the plan of the State officials to spend $1,000,000 within the next 13 months; of this sum $260,000, realized from the sale of bonds, have been deposited to the credit of the State road fund. Ultimately the Utah system will be connected with that of Colorado. The work begun last summer in the northern counties will be transferred to Washington county, in the southwestern part of the State, for the winter, where climatic conditions are favorable.

The building of State roads is an important step in the direction of opening up the southern part of the State, which is rich in mineral and agricultural resources, and the development of which is held back by lack of transportation facilities. This section is only 500 miles from the port of San Pedro and with the establishment of adequate transportation, its products could be advantageously and quickly marketed. The main line of the San Pedro, Los Angeles & Salt Lake railroad passes through Modena in the southern part of Iron county, which is the nearest railroad point to Washington county. There is good reason to hope that more railroad building may follow soon.

Construction work on the Eureka & Palisade railroad will be started soon. Contractors are now preparing to conduct the work with as little delay as possible and a large amount of material and supplies is being unloaded at Palisade. It is estimated that almost 50 per cent. of this line, that was washed out two years ago, will have to be rebuilt.

Toronto

Dec. 1—The Ontario government has let the contract for the construction of a winter road from Ruel, the end of steel of the Canadian Northern railway, 61 miles north of Sudbury, into the new gold-mining district of West Shining Tree, a distance of 25 miles. The work has already been commenced. This road, when completed, will enable the prospectors and mining men to make the trip from the railway in half a day in place of the circuitous journey from Charlton, of about 82 miles.

The Court of Appeals rendered a decision on Nov. 20, dismissing the appeal of the Canada Land Company and several oil and mineral companies from a judgment of the Chancellor in the case of Alexander Farquharson, of Tilbury township, Ont., against the company. Farquharson, together with many other farmers, had purchased land from the company on which the mineral and oil rights were reserved, and the Canada Land Company had subsequently sold the mineral rights to parties who had trespassed on the lands in search of oil and natural gas. The judgment of the lower court, which has been confirmed by the Court of Appeals, was that natural gas is not a mineral and consequently belongs to the owner of the surface rights. The matter is one of widespread interest to the landowners in the natural-gas areas of western Ontario.

Porcupine

Dec. 3—The action of the Temiskaming company, of Cobalt, in taking over the North Dome property, in Porcupine, has aroused considerable unfavorable comment among the shareholders, some of whom are asking to have the transaction investigated. The deal calls for the transfer of 138,000 shares for a consideration of $229,000, and the payments are to extend over 13 months. The North Dome is capitalized for 400,000 shares at $5 par, and there are 171,459 shares in the treasury. The Temiskaming shareholders will have to forego dividends for some time to come, as the payments for and the operation of the new property will cause a heavy drain on the company's treasury.

The new passenger service on the Temiskaming & Northern Ontario railway has finally been inaugurated and it is now possible to take a through train from Toronto to Porcupine, arriving there in 20 hours.

Much excitement has been aroused in Porcupine by a decision of Magistrate Godson ordering the deportation of 16 expert American workmen employed on the Waiwaitin Falls power dam, on the Mattagami river. In all 38 expert workmen were brought in from the Holyoke, Mass., boiler factory by the contractor, who has the contract for placing the machinery. Suits for their deportation were brought by J. D. McMurrich, acting under instructions from the Ontario crown attorney, on the complaint of the labor unions. Most of the workmen left for home of their own accord when the proceedings were taken and the remainder were willing to go if their wages were paid. This the contractor was unwilling to do, having already paid their traveling expenses. The case has been appealed on the ground that the men employed are those who make the machinery and that their services are necessary. The matter is of widespread interest to the mining community of Porcupine and other northern Ontario camps, as a large proportion of the skilled miners and mine managers are Americans, sent in by companies largely controlled in the United States, and should the decision in the power-dam cases be sustained they would be equally liable to deportation.

Alamos, Mex.

Nov. 24—Reports from Matapaco are that development is progressing in a most satisfactory manner. Tunnel sites have been located and surveys have been made for tramways from the tunnels to the mills on the bank of the Mayo river. A wide road has also been surveyed to San Bernardo, from which place there is a good wagon road to Alamos.

Rather more than the usual activity is being displayed at Sobia. Louis Wilson is doing active development work on the Prieta, and at the same time making a profit by treating a comparatively small quantity of ore in a five-stamp amalgamation mill. This property has two veins developed, each with an average width of 5 ft. The gangue is principally black calcite, between walls of andesite. The gold appears to be entirely free, but for some reason not yet ascertained, the extraction is low, the tailings carrying an average of about $17 per ton, practically all of which can be recovered by cyanidation. In the La Junta mine a new orebody 8 ft. wide has been encountered in the south vein. The mine has been developed to a depth of 240 ft., and is equipped with a 10-stamp mill and cyanide plant. A satisfactory recovery is being made, the tailings from the cyanide plant assaying less than 80c. per ton.

The shaft on the Black Fox, which is being developed by F. P. Tatum, is down about 175 ft., and a new level at 150 ft. has been driven to the orebody, which is 3 ft. wide and assays from 1 to 2 oz. gold per ton. Unlike the other ores of the camp, the gold in the Black Fox is principally coarse, and has the appearance of being entirely free milling. The mine is equipped with a 15-h.p. Fairbanks-Morse hoist.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Arizona

Cochise County

Calumet & Arizona—Two strikes of importance are reported to have been made recently in exploration work. One shows oxide ore further south than heretofore encountered and the other disclosed sulphides, also in pioneer county.

Gila County

A piece of float running high in gold was picked up about three miles north of Globe recently and has stimulated prospecting in that vicinity. The gold occurred as a telluride in weathered diabase.

It is reported that negotiations are in progress to effect a consolidation of the Miami, Keystone, Inspiration and Live Oak properties, all contiguous and with a total estimated tonnage of about 60,000,000 tons of ore.

National Mining Exploration—The local management of this company, which formerly operated the Williams and Iron Cap shafts, on Copper hill, states that the company in bankruptcy will wipe out its local indebtedness soon, and that the deed to the property will be delivered to the Iron Cap Copper Company not later than Dec. 1, after which the new company will be able to begin work.

Miami—The long delayed shafting has arrived and the fifth unit of the mill has started, bringing the daily tonnage up to 2500 tons. The mill is now producing about 90 tons of concentrate per day, averaging 41 per cent. copper. The concentrate is shipped to Cananea. The stopes in the northwestern part of the mine are beginning to produce. There are three stopes being opened up. The crosscut to the orebody, from the main shaft on the 570-ft. level, is being advanced and is now over half way to the orebody. Installation of machinery in the power house continues and the second Nordberg compressor has been shipped.

Live Oak—Development continues steadily under the supervision of Manager M. E. McCarthy. On the 800-ft. level in No. 2 shaft, a drift is being run in a northwesterly direction in ore reported to run over 3 per cent. copper. Drifting on the ore is also being done on the fourth level from No. 1 shaft.

Inspiration—The experimental mill has been started and some radical departures from present milling practice are being tried. Preliminary surveying continues and H. J. Wallace, one of the chief construction engineers, has arrived. Henry Krumb, consulting engineer, who is now at the mine, states that the main features of the construction program have been decided upon, but that there remain a few minor details to be settled. He thinks that construction will begin early in January.

Southwestern Miami—Hole No. 1 is 1285 ft. deep and is still in ore, making a thickness of 175 ft. of ore passed through. The hole is now being enlarged so that drilling may continue. Work has been delayed recently by freezing weather.

Copper and Silver Zone—High-grade silver ore is being mined by leasers on this group of claims, three miles east of Globe. In the old workings in a tunnel on the Old Ironsides claim, leasers have opened up 2½ ft. of ore reported to carry 100 oz. of silver and 2 per cent. copper, the silver occuring as the chloride, or hornsilver. On the Copper Zone claim some narrow veins of lead-silver ore are being worked, the silver occurring in galena. On the Black Crown claim a narrow vein of ore reported to carry from 40 to 80 oz. of silver and a little copper is being opened by a shaft.

Copper Reef—The mine, 12 miles south of San Carlos, is employing about 20 men. The inclined shaft is being sunk and is now about 800 ft. deep. Crosscutting is in progress on the 600-ft. level, but no ore has yet been encountered.

California

Amador County

Argonaut—The old waterpower hoist has been remodeled and the Pelton wheel is now equipped with a 2½-in. nozzle in place of the 1½-in. used formerly. The electric hoist is said to exceed its guaranty.

Amador King—This mine at Jackson is to be reopened by the Eagle Gold Mining Company, recently organized, P. L. Cassinelli, president. The company controls about 600 acres on the Belluomini ranch, on which quartz veins have been uncovered, thought as yet they have not been fully developed.

Eldorado County

Pacific—A new stamp mill, probably 40 stamps, will be installed in the early part of 1912. The Maryland claim, adjoining, is being opened to the 500-ft. level. The Placerville Gold Mining Company, Ltd., is the owner.

Inyo County

Skidoo—During October, 1495 tons of ore were milled. Total receipts were $22,449; development, $808; operating expenses, $8314; net profit, $13,326.

Sacramento County

Natomas Consolidated—The work of wrecking Natoma No. 8 dredge, recently destroyed by fire, is underway. Lumber and other material for construction of the hull of Natoma No. 10 dredge is being placed, and the construction camp is being established. This last of the recent new boats designed and constructed by the Yuba Construction Company will be in commission early in the coming year.

Union Dredging Company—The construction camp on Fassler ranch near Folsom has been established and the building of the hull for the 9-ft. bucket dredge will proceed under the direction of the Yuba Construction Company. The dredge should be ready for installation by or before the middle of 1912.

Shasta County

Evening Star—This mine, near Redding, which was closed down when the Balaklala smeltery closed, has been reopened for development. This and other mines in the district were largely dependent on the smeltery for disposal of the quartz ores. W. D. Tillotson, of Redding, is attorney and representative for the German owners.

Sierra County

Sixteen-to-One—High-grade ore has recently been cut in this mine near Alleghany, and a large shoot has been developed. W. I. Smart is superintendent.

Independence—F. A. Pearson and associates have made final payment on this mine on Wolf creek. They have operated the mine less than two years and have made it pay for development work, installing a stamp mill and completing payment for the property.

Telegraph—The tunnel, which is being run for gravel at this mine on the Mountain House-Goodyear Bar belt of serpentine, has cut the second quartz vein, which averages 8 ft. in width, shows free gold and carries a high percentage of sulphurets. Cuts at three different levels all show a large vein containing unusually rich ore. J. W. Finney is superintendent.

Trinity County

Trinity Consolidated Hydraulic Mining Company—This company has been organized with Henry W. Miller, New York, president; W. A. Boland, New York, vice-president; D. W. Shanks, Los Angeles, general manager. The company has purchased the Union Hill and Hupp mines, both hydraulic properties, at Weaversville. These properties are both equipped and with one exception, the La Grange mine, are the largest of that class in the county. In addition, the new company has purchased many water rights and a number of undeveloped placer mines in Weaverville basin. This company is not connected with the Trinity Exploration Company, which was organized to acquire and test dredging ground on the Trinity river, between Trinity Center and Carrville.

Yuba County

The Whitwell Engineering Company has been established at Marysville by C. B. Whitwell. An assay plant and a small cyanide mill for sampling have been installed.

Colorado

Clear Creek and Gilpin Counties

Mineral Chief—In this mine in the Georgetown district the production of lead-zinc ore going to the mill now amounts to about 70 tons per day. In the third level, the orebody is said to be 2 ft. wide carrying 60 per cent. lead and 45 oz. silver per ton. The lead-zinc streak is 2 ft. wide and is sent over the aërial tram to the concentrator. The mill is running 3 eight-hour shifts.

Scott—In the breast of the adit tunnel, now in 875 ft., a body of silver-lead ore has been uncovered, running 61 per cent. lead and 35 oz. silver per ton.

Spur-Daisy—This property has been transferred to the Gilpin-Mohawk Gold Mining Company. It comprises 19 claims just outside of Central City. The president of the company is William Shubert, Jr., of Philadelphia.

Grand Army—The 800-, 900- and 1000-ft. levels of this mine, an extension of the Gunnell, are being worked by 34 men on lease. The smelting ore which they are producing runs $30 per ton.

Cripple Creek District

Portland—The statement is made that the new mill on Battle mountain treated about 12,000 tons in November. The last quarterly report showed a net profit of $1 per ton in the mill, which is said to have treated 100,000 tons.

Stratton's Independence—During October the mine produced 2714 tons of ore averaging $17.58 per ton. Low-grade mine and dump ore amounting to 10,300 tons, was milled. Total net profit was $14,385; special development, $1020. It is stated that owing to the recent strike on the second level of the Independence Dike vein, the grade of the ore produced has doubled. While the dump ore treated in October averaged only $2.50 per ton, a substantial profit was realized.

Mary McKinney—In the shaft of this mine on the west slope of Ravens hill the water has been receding at the rate of 5½ in. per day, since the C. K. & N. watercourse was tapped in the deep-drainage tunnel. In the bottom level there is a shoot of ore 500 ft. long.

El Paso—The first shipment from the once flooded levels of this mine, was sent out this week from the 800 level. The returns show $130 per ton in gold for the coarse rock and $350 per ton for the screenings. If this shoot is opened in the 1000-ft. level it will mean a large revenue for the company.

Lake County—Leadville

Lessees on the New Discovery, Climax, Virginius, Amy, Porter, Hayden, Chrysolite, Discovery, Little Miami and Seneca are all shipping ore and doing development work. The claims are on the lower part of Fryer hill.

Among important works projected for this winter is the driving of a tunnel to develop at depth a group of claims on South Half Moon known as the Iron Duke, Little Maid, 16 to 1, Buckeye and Young America, Nos. 1 to 10 included. It will be driven as close as possible to the bottom of the hill, on the Buckeye claim, and will be driven to the intersection of the above veins. The new company that has taken over these properties consists of a syndicate of men of New Castle, Penn., and Youngstown, Ohio. The Iron Duke has already produced $150,000 and rich ore has been found on the Young American.

Robert Emmet—The Leadville District mill is running steadily on zinc sulphides from this mine.

Siwatch—Prospecting on the Red Hook vein is being carried on from this tunnel which is now in 5000 feet.

Rattling Jack—Good-grade carbonate of zinc ore is being shipped steadily to the smeltery by lessees of this mine on Breece hill.

Ouray County

Bachelor—This mine, about a mile below the town of Ouray, and which is said to have produced more than $2,000,000 in the past, has been under lease since October, 1910, to Arps, Krisher and others and in that period is said to have produced about $10,000. Eastern men are said to own 51 per cent. of the mine and Moritz Stockden, of Denver, has been in Ouray looking after their interests.

Camp Bird—Estimated profits for October were £41,517; balance applicable to profit, £41,217.

Idaho

Couer d'Alene District

Stewart—The new tunnel is now in 1400 ft. During the last seven days, the tunnel has been driven 117 ft., an average of 16.7 ft. per day, supposedly a record for Cœur d'Alene tunnel driving. The tunnel was driven in hard slate, only two machines could be used in the breast and the muck had to be hauled over 1300 ft. During October 363 ft. were driven. The tunnel is now approaching the Osburn fault. As soon as the fault zone is reached trouble is anticipated with water and heavy ground.

Ontario—This company has leased the Silver King mill and will start operations Dec. 1. The mill has been taken over in order that the ore, recently encountered in the mine, can be treated. The capacity of the mill is about 75 tons per day and it will handle all the ore taken out. The Ontario ore will be delivered to the mill through the Silver King tunnel.

Michigan

Copper

Hancock—In sinking the large vertical shaft a copper-bearing load was encountered at a depth of about 3100 ft. and it is believed that it is the west lode of the Pewabic series. The lode has been penetrated for about 7 ft. and the showing in copper is decidedly good. The foot wall has not as yet been reached so that the width of the formation is not known. It is estimated that the Pewabic lode will be reached at a depth of about 3600 ft., but the striking of this lode may mean that the main lode will be reached at a shallower depth.

LaSalle—The company has suspended operations and has boarded up all the surface buildings. President Shaw, in a circular to the shareholders, stated that the present metal conditions do not warrant the further expenditure of money, although No. 1 shaft was practically ready to handle the large tonnage which will be necessary, owing to the low grade of the rock. Some exploratory work is to be carried on east of the Kearsarge formation.

Keweenaw—Exploratory work on the Kearsarge lode has been suspended. While copper has appeared from time to time in the opening of this shaft nothing of a consistent nature has been revealed, although some of the drill cores showed the formation to carry copper in good quantity at various points throughout the tract.

Iron

Corrigan, McKinney—The company is exploring on S. 26—T. 43—R. 32, south of the old Lee Peck mine, about 3 miles east of Crystal Falls, and also on a tract lying north of the Great Western mine, about one mile northeast of Crystal Falls.

Breitung-Kaufman—The explorations conducted last season on S. 20—T. 43—R. 32, just north of Crystal Falls, have ceased for the present.

Montana

Butte District

Davis-Daly—Approximately 358 tons of first-class ore assaying 6.39 per cent. copper, 9.48 oz. of silver and 33c. in gold per ton were shipped during October from the Colorado mine to the Washoe and East Butte smelteries, and 980 tons of second-class ore assaying 4.29 per cent. copper, 6.33 oz. of silver and 33c. in gold per ton. From the first-class ore 51,296 lb. of copper, 3805 oz. of silver and 6.64 oz. of gold were recovered, and from the second-class ore 94,299 lb. of copper, 6959 oz. of silver and 18.12 oz. of gold, making a total yield of 145,595 lb. of copper, 10,764 oz. of silver and 24.77 oz. of gold.

Broadwater County

Butte-Radersburg — Operations have been commenced on this property southwest of Radersburg.

Deer Lodge County

On Nov. 27, Harry C. Bacorn, of Cable, and Fred W. Bacorn, of Nyack, N. Y., filed quit-claim deeds to a number of mining claims adjoining the Southern Cross mine in the Georgetown mining district; the deeds were made out to R. M. De Pue, chief clerk of the North Butte mining company.

Fergus County

McGinnis—The property, operated by leasers, has closed down for the winter. A few men will continue development work and will ship some high-grade ore.

War Eagle—The company has 100 tons of high-grade zinc ore on the dump, ready to ship to Wisconsin, but will not make the shipment before spring on account of snow.

Jefferson County

Boston & Corbin—Shaft sinking has been resumed on the property in the Corbin district. The shaft is now 70 ft. below the 1200-ft. level and will be continued to the 1500-ft. level before a station is cut. Several carloads of ore are to be shipped to two different sampling plants for testing purposes to determine the kind of plant best adapted to its treatment. On the 1200-ft. level ore has been discovered east of the shaft for the first time.

Carbonate Chief—A lease and bond has been taken on this group of claims, 6 miles from Alhambra springs, by Capt. D. Gay Stivers, J. C. Adams and others of Butte, and plans for extensive development of the property are being made. A shaft was sunk 200 ft. by the owners, Steinbronner & Roth, of Helena, and Mr. Nellinger, of Alhambra, and some ore was taken out, but operations ceased because of land troubles.

Corbin Copper — An electric-power plant has been installed near the mouth of the Bonanza tunnel, adjoining the concentrator, and it is believed that the property will soon be on a paying basis. A new orebody was recently cut in this tunnel and drifts and raises run on the vein have all shown good ore.

Lincoln County

Kalispell-Lincoln—The work of driving a tunnel on the vein of this company's property, in the West Fisher mining district, is progressing steadily and the tunnel is now in 90 ft., the pay streak averaging 2 ft. in width and assaying nearly $100 per ton in gold. The ore is free milling and the company intends to install a stamp mill for its treatment within a year.

Madison County

Garnet—The property at Pony, consisting of 11 claims, a millsite and a 20-stamp mill, has been sold to satisfy bondholders' claims aggregating $63,200. The property was bid in for $15,000 by bondholders.

McKee—Lieutenant-Governor Allen, who is interested in this group of claims at Meadow creek, has returned from making an examination of the property in company with F. A. Linforth and Alden Grimes, two Butte engineers. The property is being operated by Eugene McCallum under a lease and two carloads of high-grade ore were shipped recently to the Washoe smeltery.

Missoula County

In a copper prospect five miles from Arlee, on the Flathead Indian reservation, the discovery of a vein of asbestos has been made.

Nevada

Comstock Lode

Union Consolidated—Repairs to the main hoisting shaft have been completed from the 1920 point to the 1600 and will be carried through to the surface. Work, which was suspended in the Union and Mexican mines on account of these repairs, has been resumed on part time. Work in the north drift on the 2500-ft. level has been resumed and the drift is being advanced along the course of the vein, with all the material being saved for ore. Preliminary work for stoping is being carried on in the Mexican.

Crown Point—Ore is still being stored in the 1400-level stope, pending repairs to the Yellow Jacket shaft, through which work is carried on in the mine. Double-deck cages are being installed, which will largely increase the hoisting capacity.

Ophir—The recovery from ore last week was $20,174, representing 380 tons, averaging $53 per ton. In cutting out for a sill-floor set at a point 123 ft. in the south drift on the 2100-ft. level, ore assaying $60 per ton in average car lots, was taken out. A raise will be carried up at this point.

Ward Shaft—It is proposed to test old bulkheads soon by means of diamond drills on the 2200-ft. level, and an effort made to secure additional drainage from that point. The pumps on the 2100 and 2475 stations are working successfully.

Best & Belcher—Three shifts are now engaged in the work on the joint winze from the Sutro tunnel level, and chutes are being cut above the station. This winze will extend from the 1700 to the 2400 level.

Esmeralda County

Florence Goldfield—Reports state that the mill, machinery and outbuildings have been destroyed by fire, entailing an estimated loss of $400,000.

White Pine County

Nevada Consolidated—Tests are being conducted in the concentrator at McGill with a view of securing a higher percentage of extraction. Efforts are being directed particularly toward overcoming the loss in slimes. Work on the repumping station is being pushed. When completed it is hoped that the increased water supply will permit the operation of the mill at full capacity.

New Mexico

Chloride Flat—The company, on its claims two miles west of Silver City, has struck a body of ore at a depth of 150 ft., that is unusually high in silver.

Tom Payne—W. H. Staley, president of the Sunset Mining and Smelting Company, operating this mine at Cerrillos, New Mexico, has ordered the necessary machinery to convert the old sampler at the Cerrillos smeltery into a wet concentrating plant. The machinery will be shipped soon and it is expected to have the mill in operation in 60 days. A test shipment to the Henry E. Wood testing plant, indicated that the ore could be easily separated, making a high-grade lead and zinc product. The crude ore is said to average 6 per cent. lead and 22 per cent. zinc, besides some silver.

Germany—The company recently struck a 3-ft. vein of high-grade ore at a depth of 120 ft., and is still sinking in ore.

Tri-Bullion—Both mills are running night and day, producing a normal amount of concentrates. The east crosscut on the 200-ft. level of the Nit property is now in over 200 ft. A large body of lead and zinc ores is expected when the fault is encountered. The company is also sinking and crosscutting in the contact shaft.

North Carolina

Turner—This emerald mine, about five miles south of Shelby, Cleveland county, has been purchased by Lovat Fraser, of New York.

Utah

Juab County

Richmond-Eureka—The company has the mine in readiness to begin production as soon as the Eureka & Palisade line is ready to take ore consignments. The product is iron ore carrying some lead, its chief value being as a flux. The shaft will be sunk to greater depth, with a view to finding some of the richer lead ores that were mined in the early days of the camp. An extraction of from 100 to 200 tons per day will probably be made.

Opohongo—An orebody 4 to 5 ft. wide has been opened on the 300-ft. level; this ore runs $1 to $4 in gold, 8 to 10 oz. silver, and 8 to 10 per cent. copper.

May Day—The company is shipping an average of five cars per week. Leasers have not been able to ship for a week, owing to an accident to the hoist, which could be used for company work only. Repairs will soon be completed and shipments by leasers resumed.

Crown Point—The shaft is down 480 ft. on its way to the 500-ft. level.

Uncle Sam—There are encouraging indications in the drift being driven south from the main tunnel level to prospect new ground. The drift will be continued into the Richmond & Anaconda, four-fifths of which is owned by the Uncle Sam.

Lower Mammoth—A drift to the north, to open up undeveloped ground, has been started on the 1700-ft. level. Work on the 1000 level will be continued.

Gold Chain—Shipping ore has been opened for 400 ft. on the 300 level, for 200 ft. on the 400, and for 125 ft. on the 700. The width is from 20 to 40 ft. Two cars per day are being shipped.

Eagle & Blue Bell—On the 1300-ft. level, which produces the greater part of the weekly output of four cars, ore has been driven in for 90 ft., and in places the stope is 20 ft. wide, the ore being of shipping grade. Both faces are still in ore.

Chief Consolidated—Work is being done principally on the 1400-ft. level, and three to seven cars per week are being shipped. The management is following the ore until the ore channels are better known. Since the beginning of operations the smeltery returns have amounted to $300,000. The company owns a large area.

Swansea—The electric pump, which was out of commission for three weeks, is again in operation. On the 940-ft. level work is being done in the south and north drifts. The ore in the latter, after having pinched out for some distance has widened to 1½ ft. The ore is iron sulphide carrying from 35 to 40 oz. silver.

Mammoth—From seven to eight cars per week are being shipped, most of the ore coming from the 700- and 800-ft. levels. On the former level, the face is 20 ft. wide. The ore carries 8 per cent. copper with silver in paying quantity.

Salt Lake County

Utah Copper—Production for October was 8,660,729 lb. copper. The Arthur mill is making an extraction of 72 per cent. copper in ore running 1.46 per cent.

Ohio Copper—Twelve Wall rolls have been installed, and the average tonnage treated is 2300 tons per day.

Utah Consolidated—Since Nov. 1, the amount of ore shipped to the International smeltery at Tooele has averaged 600 tons per day.

Summit County

Thompson-Quincy—The annual report has been issued. Reference is made to the consolidation of the West Thompson and Quincy companies, resulting in the Thompson-Quincy, and to the drainage right-of-way secured from the Daly, Daly West and Ontario companies. According to a contract between the two companies, the Daly West has, since May, driven a cross tunnel on its 1200-ft. level to the southwest, for 700 ft. in Thompson-Quincy ground, the face being 4000 ft. from the Daly West shaft. About 100 ft. southwest of the West Quincy fissure, a strong fissure striking S. 60 deg. W., and dipping 60 deg. N. was encountered. Work on the crosscut tunnel will be discontinued, and drifting done to the west along the course of the fissure. It is estimated that about 500 ft. on this course will reach the contact between the Ontario quartzite and the Park City limestone. If suitable evidences of mineralization are encountered within the next 200 or 300 ft., raising to the contact will be done, after which drifting along the contact will be started. The Daly West 1200-ft. level is practically the 1700-ft. level of the Thompson-Quincy.

Daly-Judge—For eight months ended Oct. 31, production amounted to 32,278 tons of concentrating ore and 5495 tons of shipping ore; during the same period there was sold 7870 tons of lead concentrates and 2385 tons of zinc concentrates. Average monthly shipments were: Shipping ore, 687 tons averaging $27.51; lead concentrates, 984 tons averaging $27.47; zinc concentrates, 340 tons averaging $11.06. Average monthly development expenditures were $8287; mining cost, $3.55 per ton; milling cost, 80c. per ton; earnings $16,032; available balance Nov. 1, $421,235.

Washington

Blue Star—This property near Chewelah has been leased to Thomas Thomstad, and development work will be extended. The ore is silver-lead.

Tungsten Consolidated—This company is considering the installation of a concentrator on the tungsten property near Loon lake.

Republic Mines Corporation—The company, J. L. Harper, general manager, is considering the enlargement of the mill at Republic.

Lost Mine—This mine in Skamania county is to be developed by F. A. Schnicke, Husum. The ore is free milling and will be brought out on pack horses.

Canada

British Columbia

Standard—The newly installed compressor plant is being operated and machine drills have been substituted for hand drills in the more important workings. The aërial tramway lately constructed between the mine and the mill is also in use. The concentrator has been completed, as well as the waterline to it. No. 6 tunnel, at about 2100 ft. from the portal, cut an 8-ft. vein of zinc ore; a drift, started at 1900 ft. in this adit, has opened a shoot of silver-lead ore 12 ft. wide and giving from 3 to 8 ft. of shipping ore, the remainder being suitable for the mill. This mine is situated near Silverton.

Slocan Star—Driving of a long, deep-level tunnel has been commenced. The old workings are being retimbered and stopes cleaned out, preliminary to resuming extraction of ore. The main object is to drive the new tunnel far enough to get to the downward extensions of oreshoots worked at higher levels and found productive.

Ontario

A discovery of iron ore has been made on property owned by Judge Fitch, near Fort Frances, in the Rainy River district. Numerous test pits have been sunk, disclosing what is reported to be a large body of magnetite, assaying from 55 to 62 per cent. iron.

Ontario—Cobalt

Cobalt shipments for the week ended Dec. 1 were as follows: Cobalt Lake, 210,600 lb.; Nipissing, 192,937; Kerr Lake, 121,490; Temiskaming, 86,579; McKinley-Darragh, 65,320; Hudson Bay, 67,600; O'Brien, 64,030; La Rose, 63,592; Buffalo, 60,300; Drummond, 60,000; Trethewey, 59,760; Coniagas, 54,746; total, 1,106,954 pounds.

Nipissing—The hydraulic pump which is to be operated next year to remove the overburden has been tested and proved satisfactory. It is driven by a 650-h.p.

motor, from the lake, and throws a stream of 4800 gal. per min. with a head of 415 feet.

Beaver—The new mill is being rapidly completed and is expected to be finished by Jan. 15.

Kerry—Operations on the Cart Lake property, which were suspended last July, are to be resumed and the shaft put down from its present depth of 100 ft. to the 200-ft. level, where crosscutting will be done to tap veins running in from the Nipissing. Work on the Peterson Lake lease will also be resumed.

Drummond—A new vein, recently cut at the 75-ft. level, about 2 in. wide, is yielding high-grade ore. A continuous oreshoot about 50 ft. long has been opened.

Gould Consolidated—This mine, which was closed down by the government inspector, on account of the condition of the shaft, will soon be opened, the improvements ordered being nearly completed.

Rochester—The lower levels are being opened by a drift from the main shaft of the Lumsden property, adjoining, on the 300-ft. level. The drift is now in for 150 ft., and a winze is being put down to tap the Rochester vein.

Trethewey—The mill is treating an average of 100 tons per day, yielding approximately 2000 oz. silver. Charles O'Connell, who is in charge, estimates that there is in sight, underground, a three-years supply of milling ore, in addition to one year's supply on the dump. Shipments of ore from Jan. 1 to Oct. 31, 1911, amounted to 491 tons of a gross value of $299,121, as compared with 423 tons worth $275,070, during the corresponding months of 1910. The company's report as to its financial condition, Nov. 10, shows $104,695 cash in hand, due from smelteries and ore on hand, after meeting large expenses for improvements in mine and mill.

ONTARIO—PORCUPINE

Armstrong-McGibbon—Development work on the Deloro property is progressing and three shafts at 500-ft. intervals along the vein are being sunk.

Dome Extension—The shaft will reach the 200-ft. level soon, when crosscuts to cut the different veins will be started.

Hollinger—No intimation has as yet been given as to when Mr. Robbins' report may be expected. Good progress is being made with the mill.

West Dome—In crosscutting at the 125-ft. level of No. 1 shaft, a sulphide vein was encountered at 100 ft. The crosscut has been run 25 ft. further in ore.

American Goldfields—Two diamond drills will be installed immediately to test at depth a vein 2 ft. wide recently uncovered near No. 3 shaft.

Porcupine Exploration—This company, has purchased about 70 claims in the outlying districts, to be paid for in stock.

Standard—It is announced that drilling along the ridge has disclosed an orebody sufficiently large to warrant development work. The camp buildings are being rebuilt and a compressor and other machinery will soon be installed.

Martin-Porcupine, Ltd.—The property owned by D. K. Martin and A. J. Young, near the Dome, has been taken over by this company, capitalized at $2,000,000. The quartz outcroppings contain gold.

ONTARIO—SUDBURY

Mond—The company has started extensive development work with diamond drills on the Blue Lake property in Cochrane and McVittie townships. The ore outcrops along the eastern edge of Moose lake and probably extends under the lake.

Canadian Copper Company—Work has started on the building of a railroad to connect the Froude mine with the roast yard and smeltery at Copper Cliff. The company recently started up the second basic converter and is converting a somewhat lower grade of matte than formerly.

Mexico

CHIHUAHUA

It is reported that Stallforth y Hno. have given an option on their Sierra Madre property on the Veta Colorada, near the Refugio mine, to an English syndicate represented by Paul Ginther. The price is said to be $100,000.

Pending the installation of modern hoists and machinery, several mines of the American Smelting and Refining Company in the Santa Eulalia district are closed.

Aguilerena—This mine, leased by E. Kock and Carlos Nausester, is producing some ore of fair grade; two cars have been shipped.

Sierra Plata Mining Company—Work at this property, at Villa Escobedo, continues without any material change. A good grade of ore is being mined. R. H. Allen is in charge.

Perros Bravos—At this mine, in the Santa Barbara district, B. B. Butler is shipping low-grade copper ore from the dump. It is expected that work will soon begin on the Cabras mine, adjoining the property of the Montezuma Lead Company on the eastern boundary.

COAHUILA

A general strike of laborers for higher wages and shorter hours has caused suspension of work at a number of properties.

San José de Gracia—A. E. Place, formerly of the company of Place & Elton, has taken over the bond and lease of the San José mine and mill in the Sierra Juarez district. He intends to increase the scale of working. The property is already producing.

Victoria y Tapado—This mill is now shut down awaiting the installation of new rolls. The work done at the mill has been satisfactory for the few months it has been in operation; work will soon be resumed.

JALISCO

San Miguel Gold Mining Company—Operations on this property were commenced about two years ago, and the development work so far done justifies the erection of a reduction plant. The plant will have a capacity of 30 tons per day, and it is expected that the average of the milling ore will be about 20 grams gold per ton. The machinery which is now on the way to the mine consists of a Dodge crusher, a Lane mill, concentrators, amalgamating plates, a boiler, two engines, a pumping plant and machine-shop equipment. The ore contains gold, silver and copper. The treatment for the present will be concentration and amalgamation. The mine is about 10 miles from Ejutla, southeast of Union de Tula. Bryant McLellan is general manager.

SONORA

Rancho Seco—At this placer property, near Carbo, a shaft has been sunk to a depth of 200 ft., and bedrock has not yet been found. E. Massey, formerly general manager of the Four C's Company, is at present operating the mine.

Monte Visto—It is stated that at this mine, near the El Tigre, a mill may be built in the near future. The low-grade gold and silver ore can be worked at a profit if a mill is built at the mine.

Gueriguita—It has been announced that a mill and cyanide plant will be built at this property, about 30 miles south of Nacozari. The plant will have a capacity of 50 tons per day. There are at present about 30 men employed, and development work has shown a fair quantity of commercial silver ore. L. C. Penhoel is metallurgist for the company.

North Tigre—It is stated that this company is planning to resume operations in the near future.

Vaquero—Rich ore has recently been taken from this property, six miles from Nacozari. A recent shipment of 70 sacks of ore netted the lessee $40,000. The ore is rich in both gold and silver.

Promontorio—The Phelps-Dodge company has foreclosed the mortgage which it has held on this copper property about 80 miles south of Nacozari, for several years. No operations are contemplated.

Asia

CHOSEN

Oriental Consolidated—Cable reports state that the cleanup for November amounted to $137,500.

The Markets

Coal Trade Review

New York, Dec. 6—The coal trade in general is manifestly improving. The gain is certainly greater than would be due simply to the prevalence of cold weather over a very large section of the country during the past week. In the West an increase in the buying of steam coal is reported from so many points, that it seems to be becoming general. There is much complaint of car shortage, but this will probably be alleviated to some extent by the closing of the Lake trade, which will release a number of cars for other trade. Slow transportation, due to poor condition of equipment on many lines, is another drawback to the trade.

The seaboard bituminous trade is also improving, demand for steam coal being better and prices firmer. The coastwise trade is slow, on account of bad weather and shortage of vessels, which have caused a sharp advance in rates, though trade to the shoalwater ports is nearly over for the season.

Anthracite trade is strong and the continued large production of coal is being absorbed without difficulty. Both domestic and steam sizes are in good demand.

The continued talk about probable trouble over the rate adjustments next spring is beginning to have some effect, and dealers note an increasing disposition among the larger consumers to put in stocks ahead.

In the 10 months ended Oct. 31 the coal tonnage of the Pennsylvania railroad lines east of Pittsburg and Erie was: Anthracite, 9,581,057; bituminous, 34,551,595; coke, 8,814,649; total, 52,947,301 short tons. As compared with 1910, there were increases of 490,501 tons in anthracite and 500,860 in bituminous coal; and a decrease of 2,344,453 tons in coke; making a total decrease of 1,353,092 tons, or 2.5 per cent.

Foreign Trade—Exports of fuel from the United States, 10 months ended Oct. 31, were: Anthracite, 3,016,127; bituminous, 11,643,931; coke, 777,861; bituminous furnished to steamships in foreign trade, 5,570,548; total, 21,008,467 long tons. The total increase over 1910 was 3,285,554, chiefly in exports to Canada. The principal exports this year were 11,902,880 tons to Canada and 1,302,882 tons to Cuba and the other West Indies.

Imports of fuel into the United States 11 months ended Oct. 31, were: Anthracite, 42; bituminous coal, 998,753; coke, 60,913; total, 1,059,708 long tons. This is a decrease from 1910 of 688,516 tons, chiefly due to the cessation of mining in Alberta and British Columbia. The chief imports were 818,081 tons from Canada and 163,628 tons from Australia.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Nova Scotia Coal—Shipments of coal from Nova Scotia mines 10 months ended Oct. 31 were 4,436,907 long tons; an increase of 438,607 tons, or 11 per cent., over last year.

French Coal Production—Coal production of France, half year ended June 30 was: Coal, 19,153,543; lignite, 363,256; total 19,516,799 metric tons. This is an increase of 562,466 tons, or 3 per cent., over last year.

IRON TRADE REVIEW

New York, Dec. 6—The main incident of the markets this week has been a continuance of the heavier buying of pig iron, which promises to reach large dimensions. Basic sales have been large as well as those of foundry iron. Some bessemer pig has also been sold. It is estimated that over 800,000 tons of pig iron have been placed in the past week. Much of this has been sold at low prices. Alabama foundry and basic have sold as low as $9.25, though most of the business has been placed at $9.50@10, Birmingham. Virginia furnaces have held for $12@12.25, and Lehigh Valley iron has sold at $13.50 at furnace. In connection with these sales there has been active demand for scrap, especially heavy steel and casting scrap.

Some further orders have been taken for cars and rails, and quite a number for bridges. Plates are in steady demand and finished material generally is selling well. Prices remain near the lowest, but there is an upward tendency beginning to be apparent. The Republic and some other companies are asking $1 per ton more for bars.

Perhaps one notable point is an increasing disposition to extend contracts and to order material for deliveries further ahead than has been the rule for some time past.

Berlin advices report that the three large German companies—Gelsenkirchen, Gutehoffnungs-Hütte and Niederrheinische Hütte—that produce ferromanganese have effected an arrangement with English producers as to prices and markets.

Baltimore

Dec. 4—Exports for the week included 1,079,860 lb. steel rails and 184,055 lb. track fastenings to Port Limon, Costa Rica; 1,478,720 lb. steel rails and 139,083 lb. rail joints to Puerto Barrios, Guatemala; 2,008,580 lb. steel billets to Liverpool; 1,911,486 lb. miscellaneous iron and steel to Panama. Imports included 10,300 tons iron ore from Cuba.

Birmingham

Dec. 4—The sale of a great quantity of pig iron for delivery during the first half of the coming year does not appear to have caused any better feeling among the Southern iron manufacturers. That much of the reported sales was at a price under $10 per ton, No. 2 foundry, is not denied. That there will be no need for further increasing the make is the statement of a high official of one of the larger companies. The make at present is larger than it ought to be, and if there is no improvement in the steel demand the furnaces now running on basic iron will be put to work on foundry iron. Then there is a good quantity of pig iron still in the furnace and warrant yards in Southern territory. A prominent iron man in discussing the situation asserted that the iron sold does not mean anything big, the price being under $10 per ton and the iron being sold on a slow and undetermined market.

Delivery on the iron lately sold begins in January. There is need for orders for steel. At present the big steel plant of the Tennessee Coal, Iron and Railroad Company at Ensley is working five days a week and on single turn. There are a couple of orders already in hand on which delivery will begin on the turn of the year but there is need for others.

Charcoal iron promises to be in good demand early in 1912. The scrap-iron market in the South continues quiet. The machine shops and foundries are in operation with a fair volume of business. Cast-iron pipe plants are still busy.

Chicago

Dec. 4—With more activity in the pig-iron market and a general tendency since Thanksgiving to buy more freely in the finished lines, the local iron and steel market seems to be looking up. There is no evidence of a decided improvement in the price of pig iron, however, for in the last week considerable Southern No. 2 iron has changed hands at $9.75@10 Birmingham—which means $14.10@14.35 Chicago—and increased demand does

not seem to be operating to stiffen the price. The reason apparently is overproduction, at least to the extent of creating stocks that must be moved at very low prices.

There is a brisk movement of malleable iron now, which brings in many new inquiries for good-sized lots, and it is possible the general bettering of business marks the turning point, though signs are too uncertain yet for confident statement. The bulk of the foundry trade is in small lots—up to 700 or 800 tons on each order—for first-quarter and first-half delivery. That the users of small tonnage will follow the big fellows in buying more freely is prophesied by some dealers, though local sentiment inclines to the idea that the East is experiencing a revival of business that will not soon affect this market. Northern iron remains at $14@14.50 for No. 2 and is rather quiet compared with Southern. Lake Superior charcoal holds to $16.50, with fairly good sales.

In finished lines the railroads are the best buyers, though not so largely increasing orders as in Eastern centers, and there is a natural lessening of structural materials due to the coming of winter. Bars are still under Pittsburg quotations plus freight, owing to the activity of local producers. Bar iron brings 1.15c. and soft-steel bars 1.20c. Chicago delivery. Plates in light demand at 1.28c. minimum; sheets and wire products are in fair to light demand.

Cleveland

Dec. 4—Only a few boats are yet to come in with iron ore. The recent revival in pig iron makes it look as if the coming winter will make pretty heavy drafts on the dock stocks.

Pig Iron—Sales have been larger and business more active than for a long time past. Heavy orders have been placed for foundry and basic iron in this territory. Most of this business has been done at low prices. Quotations current, Cleveland delivery, are $15.15 for bessemer, $13 for basic, $13@13.25 for No. 2 foundry and $12.50 for gray forge.

Finished Material—Business has been active, with many orders coming out for plates, bars, wire and structural steel. Competition for these orders is sharp and prices continue low.

Philadelphia

Dec. 6—The pig-iron market is still active and there has been a lot of buying for first quarter. Foundry has the first call, but basic is also being looked after; only forge drags. Southern iron had the first place, being offered at pretty low prices. No. 2 X foundry is still around $15, with $14.50 named for basic.

Steel Billets—Business has been small, chiefly because the price situation is mixed.

Bars—Sales of bars have been made freely, but at recent low prices.

Plates—Business is still going well, but the competition between local and Western mills keeps quotations down.

Pipes and Tubes—Business is stronger and there are reports of more orders coming.

Sheets—Local mills are working up to capacity and buyers are still coming in.

Structural Material—Demand is quieter, as was to be expected at this season. Some large orders, however, are being talked over.

Scrap—A demand for casting and heavy steel scrap has made dealers sit up and listen. More scrap has been called for than for some time past.

Pittsburg

Dec. 5—Outside of the advance of $1 a ton in steel bars, indicating that the bar mills have worked up into a fairly comfortable position, the news of the past week in iron and steel has not been particularly favorable. The independent cutting of merchant pipe late in November led to the National Tube Company issuing a new list, under date of Dec. 1, carrying a reduction of one point on butt weld, 3-in. and under, and of two points on lap weld, 2-in. and over, or $2 and $4 per net ton respectively. Wire products have declined $1 a ton, the slight cutting in the latter part of November developing into an open decline, and the wire market is now quotable at $1.50 for nails, 1.30c. for plain wire, 1.50c. for painted barb wire and 1.80c. for galvanized barb wire.

No additional car orders of moment have been placed, although there has been large inquiry in the market. The Pennsylvania system had been expected to swell the present movement, which amounts to 40,000 cars bought since the closing days of October, but it may be recalled that the Pennsylvania has been tentatively in the market for several months, and if the railroads are buying cars because they are particularly cheap, the Pennsylvania may lose nothing by waiting 30 or 60 days.

The general run of finished steel orders has shown some slight signs of diminishing, due doubtless to the progress of the season. No large decrease in buying is expected on account of the approach of the annual inventory period, since stocks are already down to bed rock, but no substantial improvement is in sight until after the turn of the year.

It was the Republic Iron and Steel Company which broke the steel-bar market last May, announcing its withdrawal from the coöperative movement and a reduction from 1.40c. to 1.25c. in its price for steel bars, and it is thus interesting to observe its taking the lead in the other direction. The advance announced late last week by the Republic company was $1 a ton, to 1.10c. for early shipment and 1.15c. on contracts for first quarter or first half. The action was promptly followed by other mills, and the market is now quotable on the advanced level.

Pig Iron—A sale of 2500 tons of bessemer iron has been made at $14.25, Valley, for delivery over the first-half of the new year, but the market is not strong at that figure. The 25,000-ton sale last month from the Ohio Iron and Steel Company to the Republic Iron and Steel Company, reported at $14.25. proves to have been $14 at furnace, or about $14.25 delivered. Besic inquiry is large, including a tentative inquiry from the Jones & Laughlin Steel Company, which may want to start its steel plant at Aliquippa for a short run, without putting any of the Aliquippa furnaces into operation. Foundry iron is moving in a quiet way. We quote: Bessemer, $14.25; basic, $12.50; No. 2 foundry, $13.25; malleable, $12.50; forge, $12.75, all at Valley furnaces, 90c. higher delivered Pittsburg.

Ferromanganese—The market continues unsettled and more or less nominal. We quote prompt at $37.50@38 and forward at $38@38.50, f.o.b. Baltimore.

Steel—Prices have openly declined somewhat, chiefly to furnish a settling basis on contracts which have become nominal and require monthly bartering as to the settlement price. We quote bessemer and openhearth billets at $18.50 and sheet bars at $19, f.o.b. maker's mill, Pittsburg or Youngstown, for early delivery, with wire rods nominally at $26, Pittsburg.

Sheets—A heavy volume of business continues to be booked, but at extremely low prices. We quote black sheets at 1.80@1.85c., galvanized at 2.80@2.85c. and blue annealed at 1.35@1.40c., f.o.b. Mahoning valley mill. For prompt shipment the prices on black and galvanized are sometimes shaded a trifle.

St. Louis

Dec. 4—There has been quite a little buying going on of Southern iron and altogether about 6000 tons have been purchased. Most buyers seem to be covered for the first half of next year and the price remains strong at $10 per ton, Birmingham, for No. 2 foundry or $13.75, St. Louis. Northern iron has been stiffening up considerably since several large purchases have been made in the East.

Iron Ore Trade

German Iron Ore—Imports and exports of iron and manganese ores in Germany, nine months ended Sept. 30, metric tons.

	Imports	Exports	Net Imports
Iron ore.....	8,312,326	1,973,567	6,338,759
Iron ore, 1910.....	6,948,926	2,248,480	4,700,446
Manganese ore.....	325,559	5,282	320,277
Manganese ore, '10	417,189	3,233	413,956

Imports of slag and slag products this year, 499,490 tons; exports, 69,243 tons.

British Iron-Ore Trade—Imports of iron ore into Great Britain, 10 months ended Oct. 31, were 5,856,724 tons in 1910, and 5,411,834 in 1911; decrease, 444,890 tons. Imports of manganese ore, 440,386 tons in 1910, and 317,278 in 1911; decrease, 123,108 tons.

French Iron Ore Trade—Imports of iron ore into France, half year ended June 30, were 647,183 metric tons in 1910, and 695,953 in 1911; increase, 48,773 tons. Exports were 2,344,339 tons in 1910, and 2,901,891 in 1911; increase, 557,552 tons. Exports were chiefly of minette ores from the Briey basin, to Belgium and Luxemburg.

Sault Ste. Marie Canal Traffic

The freight passing through the Sault Ste. Marie canals in October was 7,921,572 tons, or well up to the September movement. For the season to Nov. 1 the total freight was, in short tons:

	1910	1911	Changes
East-bound	43,288,425	32,230,708	D. 11,057,717
West-bound	13,417,542	15,129,031	I. 1,711,489
Total	56,705,967	47,359,739	I. 9,346,228

The number of vessel passages this year was 16,406, showing an average cargo of 2887 tons. The mineral freights included in the totals were as follows, in short tons, except salt, which is given in barrels:

	1910	1911	Changes
Coal	11,960,386	13,664,445	I. 1,704,059
Iron ore	39,009,985	28,243,341	D.10,766,644
Pig and mfd. iron	359,981	353,309	D. 6,672
Copper	115,373	104,444	D. 10,929
Building stone	9,485	4,367	D. 5,118
Salt, bbl.	483,529	530,778	I. 47,249

Iron ore was 59.6 per cent. of the total freight this year and coal 28.8 per cent.

FOREIGN IRON TRADE

British Foreign Trade—Exports and imports of iron and steel, and of machinery, in Great Britain, 10 months ended Oct. 31, as valued by the Board of Trade returns:

	Exports	Imports	Excess
Iron and steel	£35,804,215	£9,109,220	Ex. £26,694,995
Machinery	25,444,377	4,842,529	Ex. 20,601,848
Cutlery and hardware	8,311,288	4,250,050	Ex. 4,061,238
New ships	4,413,072	.....	Ex. 4,413,072
Total	£73,972,952	£18,201,799	Ex. £55,771,153
Total, 1910	76,447,096	14,722,269	Ex. 61,724,827

Decrease in exports this year, £2,474,144, or 3.2 per cent.; increase in imports, £3,479,530, or 23.6 per cent. The quantities of iron and steel were, in long tons:

	1910	1911	Changes
Exports	3,829,399	3,681,253	D. 148,146
Imports	1,092,587	1,442,942	I. 350,355

The greater part of the tonnage increase in imports was in blooms, billets, slabs and tinplate bars. The chief decrease in values of exports was in new ships.

Iron in Japan—A recent consular report puts the production of pig iron in Japan in the year 1910 at 71,963 tons. Imports for the year were 117,227 tons, nearly all from Great Britain. Imports of iron ore were 208,191 tons; 61 per cent. being from China and 35 per cent. from Korea.

METAL MARKETS

New York, Dec. 6—The metal markets are much less excited, but price changes are interesting.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold:			
Oct. 1911	$3,983,994	$ 4,102,427	Imp.$ 118,433
" 1910	750,330	4,250,259	Imp. 3,499,929
Year 1911	22 247,304	49,279,533	Imp. 27,032,229
" 1910	56,068,411	49,932,386	Exp. 6,136,025
Silver:			
Oct. 1911	5,087,087	3,404,458	Exp. 1,682,629
" 1910	4,269,575	3,395,200	Exp. 874,375
Year 1911	54,615,048	37,100,888	Exp. 17,514,160
" 1910	46,034,318	36,652,464	Exp. 9,381,854

Exports from the port of New York, week ended Dec. 2: Gold, $150,000, to the West Indies and Panama; silver, $940.040, to Paris and London. Imports: Gold, $453,028, chiefly from Mexico; silver, $46,090, from Central and South America.

Gold—Prices on the open market in London were unchanged, at 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. There was some demand for Egypt, but most of the supplies went to the Bank of England.

Iridium—Prices of this metal are steady, $64 per oz. being asked for pure metal.

Platinum—The market is quiet, and quotations are unchanged. Dealers ask $46 per oz. for refined platinum, and $48.50 per oz. for hard metal. The foreign market continues firm.

Silver—The market continues steady, with a slight receding tendency. The difference between spot and futures has dwindled to ⅛d., showing that the shorts are fairly well covered.

SILVER AND STERLING EXCHANGE

Nov.-Dec.	30	1	2	4	5	6
New York	....	55⅝	55⅝	55⅝	55⅛	55
London	25 9/16	25 9/16	25 11/16	25 9/16	25 7/16	25⅜
Sterling Ex.	....	4.8615	4.8620	4.8620	4.8615	4.8610

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Shipments of silver from London to the East, Jan. 1 to Nov. 23, reported by Messrs. Pixley & Abell:

	1910	1911	Changes
India	£6,213,000	£7,802,700	I. £1,589,700
China	1,328,500	990,300	D. 338,200
Total	£7,541,500	£8,793,000	I. £1,251,500

India Council bills in London averaged 16.06d. per rupee for the week.

Shipments of silver from the United States to China direct, for the nine months ended Sept. 30, were valued at $3,865,735 in 1910, and $6,399,172 in 1911; increase, $2,533,437. These values are approximately equivalent to 7,430,700 oz., and 12,119,200 oz., respectively.

Copper, Tin, Lead and Zinc

NEW YORK

Nov.-Dec.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
30	.....	.....	....	....	.....	.....	.....
1	13.25 @13.30	13.05 @13.10	45	4.45	4.30 @4.35	6.40 @6.65	6.25 @6.50
2	13.25 @13.30	13.05 @13.10	45	4.45	4.30 @4.35	6.40 @6.65	6.25 @6.50
4	13.25 @13.30	13 05 @13.10	45⅜	4.45	4.30 @4.35	6.40 @6.65	6 25 @6.50
5	13.25 @13.30	13.05 @13.10	45	4.45	4.30 @4.35	6.40 @6.65	6.25 @6.50
6	13.25 @13.30	13.05 @13.10	45	4.45	4.30 @4.35	6.40 @6.65	6.25 @6.50

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Nov.-Dec.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
30	58 11/16	59 1/16	63¼	205	193¼	15¾	27
1	59 1/16	59 1/16	63½	204	193	15¾	27
2	.....	.....	.....	.....	.....	.....	.....
4	59	59¼	63¼	206	194¼	15¾	27
5	58 15/16	59 1/16	63	205	193¾	15 13/16	27
6	58½	59¼	62¾	205	193¼	15 13/16	27

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17¼c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

Copper—While the activity has subsided somewhat, a fair business has been doing from day to day for both home trade and export, at practically unchanged prices. For the time being the market appears to be waiting upon the statistics which are to be published on Friday, Dec. 8. The close is steady at 13.25@13.30c. for lake; 13.05@13.10c. for electrolytic in cakes, wirebars or ingots. Casting copper is quoted nominally at 12¾@13c. as the average for the week.

Up to Dec. 4, the standard market held firm at about the highest prices, but there was a sharp break on Dec. 5, which brought quotations at the close down to £58 10s. for spot and £59 5s. three months.

Copper sheets have been advanced ½c., and are now 18½@19½c. base, for large lots. Full extras are charged and higher prices for small quantities. Copper wire has again been advanced, to 14½c. base, carload lots at mill.

Copper exports from New York for the week were 4027 long tons. Our special correspondent gives the exports from Baltimore at 455 tons.

Visible supplies of copper in Europe on Nov. 30 are reported as follows: Great Britain, 44,600; France, 5490; afloat from Chile, 2300; afloat from Australia, 6350; in Rotterdam, 5700; in Hamburg, 8900; total, 73,340 long tons. This is a decrease of 2310 tons from the Nov. 15 report.

Tin—The Banka sale took place on Nov. 30 and realized for the Dutch government what proved to be the highest price at which its tin had ever sold, £208. This means a premium of about £3 over the Straits quotation on the day of sale and reflects the apprehensions of the continental consumers toward syndicate operations in the near future. The syndicate managers have again proved their hold on the market by putting up the spot quotation on all transactions. The close is steady at £205, for spot and £193 5s. for three months.

Hardly any business is reported from consumers in this market. Spot tin is scarce and commands a premium of about ⅝c. per lb. Some transactions for December delivery took place between dealers on about the importation basis. At the close December tin can be purchased at about 45 cents.

Visible stocks of tin on Nov. 30, including tin afloat, are reported as follows: London, 10,683; Holland, 746; United States, excluding Pacific ports, 2732; total, 14,161 long tons, a decrease of 2469 tons during November. A partial explanation of the large decrease is that the latest Banka sale took place Nov. 30, so that the tin sold did not appear in the statistics.

Lead—The market is unchanged at 4.45c., New York, and 4.30@4.35c., St. Louis.

The London market is somewhat easier, the close being cabled at £15 16s. 3d. for Spanish lead, and 2s. 6d. higher for English metal.

Spelter—This market came this week into the position where no one, broadly speaking, wanted to buy and sellers seemed so generally sold out that they had nothing much to offer except for rather distant delivery. A little business was reported done in the early part of the week at about 6.50c. and some offers down to 6.25c. were reported. We are only able to quote the market for this week as nominal, at 6.40@6.65c., New York, and 6.25@6.50c., St. Louis.

The London market is unchanged at £27 for good ordinaries and 2s. 6d. more for specials.

Base price of zinc sheets is $8.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Zinc dust is quoted at 7⅜c. per lb., New York.

Other Metals

Aluminum—Business has been rather quiet. Quotations are unchanged, at 18½@19c. per lb. for No. 1 ingots, New York. The latest quotation for aluminum ingots received from London is £55@58 per long ton—equal to 11.95@12.56c. per lb. This is about on a parity with the New York quotation, duty paid.

Antimony—Business continues on a small scale, and prices are not at all firm. Cookson's is quoted at 7¾c. per lb. and Hallett's at 7⅜@7⅝c.; while 6⅝@6⅞c. is named for Hungarian, Chinese and other outside brands.

Quicksilver—The market is rather quiet and prices are weak. New York still holds at $45 per flask of 75 lb.; San Francisco at $44.50 for domestic orders and $42 for export. The London price has been reduced to £8 2s. 6d. per flask, with the same figure quoted from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Cadmium—The last quotation was 700 @725 marks per 100 kg.—75.5@78.3c. per lb.—at works in Germany, according to quantity.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@50c. per lb. Retail spot from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Spanish Metal Exports

Exports of metals and minerals from Spain, eight months ended Aug. 31, reported by *Revista Minera*, in metric tons:

Metals	1910	1911	Changes	
Pig and manuf. iron	33,180	30,698	D.	2,482
Copper	12,696	10,747	D.	1,949
Copper precipitate	10,302	9,878	D.	424
Lead	127,841	101,885	D.	25,956
Zinc	1,099	1,431	I.	332
Quicksilver	1,302	1,480	I.	178
Minerals				
Iron ore	5,835,029	5,211,711	D.	623,318
Manganese ore	4,030	23,825	I.	19,795
Copper ore	675,738	218,689	D.	457,049
Lead ore	2,419	1,963	D.	456
Zinc ore	88,772	94,688	I.	5,916
Pyrites, iron	1,000,287	1,783,604	I.	783,317
Salt	378,024	338,002	D.	9,978

The large changes in copper ore and pyrites are due chiefly to a change in classification, under the law. Pyritic ores were formerly classed as copper ore when they carried 1 per cent. or more in copper; but under the new law such ores are classed as pyrites when they carry less than 2.5 per cent. copper.

Imports and Exports of Metals

Exports and imports of metals in the United States, nine months ended Oct. 31, are reported as follows, in the measures usual in the trade:

Metals	Exports	Imports	Excess	
Copper, long tons	292,949	127,837	Exp.	165,112
Copper, 1910	248,908	124,799	Exp.	124,109
Tin, long tons	948	41,064	Imp.	40,116
Tin, 1910	574	40,509	Imp.	39,935
Lead, short tons	87,933	76,130	Exp.	11,803
Lead, 1910	58,955	89,007	Imp.	30,052
Spelter, sh. tons	5,259	1,337	Exp.	3,922
Spelter, 1910	2,688	2,952	Imp.	264
Nickel, lb.	20,785,319	24,340,929	Imp.	3,555,610
Nickel, 1910	11,844,187	26,703,630	Imp.	14,859,443
Antimony, lb.	160,844	8,848,874	Imp.	8,688,030
Antimony, 1910	185,237	8,493,004	Imp.	8,307,767
Platinum, oz.	95	104,865	Imp.	104,775
Platinum, 1910	47	101,890	Imp.	101,843
Aluminum, value	$1,008,936	.....	Exp.	$1,008,936
Aluminum, 1910	702,687	.....	Exp.	702,687
Ores, etc.				
Zinc oxide, lb.	23,696,627	.....	Exp.	23,696,627
Zinc oxide, '10	21,769,676	.....	Exp.	21,769,676
Zinc dross, lb.	8,202,775	.....	Exp.	8,202,775
Zinc dross, '10	8,165,112	.....	Exp.	8,165,112
Zinc ores, lg. tons	16,322	46,795	Imp.	30,473
Zinc ores, 1910	15,590	63,304	Imp.	47,714
Chrome ore, tons	5	28,416	Imp.	28,411
Chrome ore, '10	30	38,559	Imp.	38,529

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Imports of aluminum for July, August, September and October, 1911, were 1,885,576 lb.; not reported previous to July 1, 1911. The metal exports given above include reëxports of foreign material. Zinc contents of ore imported were 44,367,994 lb. in 1910, and 30,459,791 lb. in 1911. There were reexported foreign ores containing 7,604,028 lb. metal in 1910, and 18,067,423 lb. this year; leaving net imports of zinc in ore 36,763,966 lb. in 1910, and 12,392,368 lb. this year.

Zinc and Lead Ore Markets

Platteville, Wis., Dec. 2—The base price paid this week for 60 per cent. zinc ore was $46. The base price paid for 80 per cent. lead ore was $54@55 per ton.

SHIPMENTS, WEEK ENDED DEC. 2

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Galena	577,900	.....	.....
Platteville	571,000	.....	.....
Cuba City	376,720	.....	243,000
Hazel Green	303,300	59,700	.....
Benton	240,000	.....	249,000
Highland	184,600	.....	.....
Mineral Point	148,900	.....	.....
Harker	147,970	.....	.....
Rewey	80,000	.....	.....
Total	2,630,390	59,700	492,000
Year to date	140,961,879	8,105,965	26,947,240

Shipped during week to separating plants, 1,861,290 lb. zinc ore.

Joplin, Mo., Dec. 2—The highest price paid for zinc sulphide ore was $51, the base per ton of 60 per cent. zinc was $44@48. Zinc silicate sold on a base of $25@28 per ton of 40 per cent. zinc. The average price, all grades of zinc ore, was $45.94. Lead ore sold as high as $63.50 per ton, this price being paid for at least three large bins. The average price, all grades of lead, was $60.16 per ton.

A large portion of the output of the

new field northwest of Joplin was cut off this week by freezing weather and accidents. The output of Sarcoxie has been wiped out by dissensions between landowners and leaseholders, and in other portions of the district outputting has been restricted from various causes, reducing the total output to approximately 5000 tons.

SHIPMENTS, WEEK ENDED DEC. 2

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,130,480	.....	724,210	$117,088
Joplin	2,056,490	.....	311,140	58,690
Duenweg	594,740	187,890	78,000	18,836
Galena	458,120	11,620	119,080	14,283
Cave Springs	541,250	.....	.....	14,070
Alba-Neck	256,540	.....	60,440	7,840
Miami	.....	.....	224,540	6,736
Jackson	269,120	.....	4,950	6,728
Carl Junction	204,890	.....	.....	5,220
Quapaw	113,810	.....	31,940	3,348
Spurgeon	124,190	48,560	15,000	3,083
Granby	.....	173,230	26,430	2,910
Oronogo	40,920	.....	53,770	1,962
Aurora	82,320	.....	.....	1,893
Saginaw	.....	61,000	22,900	1,660
Lawton	70,340	.....	.....	1,618
Carthage	65,000	.....	.....	1,420
Totals	9,008,230	482,300	1,672,400	$267,385
48 weeks	461,033,150	33,511,950	83,632,930	$12,241,188

Blende val., the week, $211,061; 48 weeks, $9,351,634
Calamine, the week, 7,005; 48 weeks, 511,077
Lead value, the week, 50,319; 48 weeks, $2,379,477

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1910	1911	1910	1911	1910	1911
January	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February	40.69	40.21	39.47	39.16	53.64	54.46
March	43.60	39.85	39.71	38.45	51.26	54.57
April	41.00	38.88	39.33	37.47	49.72	56.37
May	40.19	38.25	37.51	36.79	48.16	55.21
June	40.20	40.50	37.83	38.18	48.80	56.49
July	39.63	40.75	36.80	38.36	48.59	58.81
August	40.13	42.50	37.32	41.28	49.75	60.74
September	43.45	42.63	39.96	41.29	54.73	59.33
October	43.31	42.38	40.50	40.89	53.18	54.72
November	47.20	45.40	43.20	43.25	54.80	57.19
December	42.50	.....	40.70	.....	55.70	.....
Year	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, Dec. 6—The general markets seem to have lapsed into a quiet condition, and are inclined to be dull.

Copper Sulphate—A fair business is being done and prices are unchanged. Quotations are $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller orders.

Arsenic—Business is improving and prices are higher, closing firm at $2.37½ @2.50 per 100 lb. for white arsenic. More arsenic is being imported from Europe, taking the place of the Mexican material, of which none has been received for some time.

Nitrate of Soda—Business is better again. Spot nitrate is still quoted at 2.20c. per lb., but futures are a shade firmer, 2.22½c. being asked for deliveries next year.

Petroleum

The Oil City *Derrick* gives the following summary of new wells completed east of the Mississippi in November: Eastern district, including New York, Pennsylvania and West Virginia, 415; Lima-Indiana, 62; Kentucky, 12; Illinois, 129; total, 618. The total daily production was 9847 bbl., an average of 15.9 bbl. per well.

German Byproduct Trade

In the nine months ended Sept. 30, Germany exported the following byproducts of the coal and coke industry:

	1910	1911
Ammonium sulphate	77,803	65,500
Coal tar	32,693	40,532
Coal pitch	35,982	87,044
Benzol	4,962	15,820
Light coal-tar oil	7,679	3,633
Heavy tar oils and asphalt	62,033	73,104
Miscellaneous	22,190	20,128
Total	243,342	305,761

The total increase this year was 62,419 tons. Imports of byproducts were 68,910 tons in 1910, and 70,264 tons this year.

MINING STOCKS $

New York, Dec. 6—With a fair degree of strength and only small fluctuations, the general stock market has been rather quiet and narrow, with small trading. The holiday and waiting for the President's message are given as reasons.

One sale of Homestake was reported, at $86.50 per share.

The Curb market has shown also rather light trading and small fluctuations. Cobalt stocks were dull. The copper stocks were inclined to be irregular, and sales were only moderate. Other mining shares were rather neglected.

Boston, Dec. 5—Reactions have followed in a great many cases from the recent high prices made by mining stocks in this market, although a firm undertone is maintained and sentiment is more optimistic than ever. Live Oak, Inspiration and Hancock have lately come to the front with big advances. The taking over of control of Live Oak by the Ryan-Amalgamated crowd has brought strong buying in this specialty, enough to cause a $6.25 advance in the price to $36. Talk of a consolidation of this property with the Miami, Keystone and Inspiration has infused life into these securities. Inspiration is up close to $10 per share, a rise of over $1. There is also considerable talk of merger of some of the Lake Superior mines, although as yet no names are mentioned. This would naturally take in some of the mines that were planned to be consolidated with the Calumet & Hecla almost a year ago.

North Butte continues to be obstinate, yet it has risen over $5 from the recent low of $20.25. The future of this mine depends upon the contents of the Edith May and Jessie veins at the 2800-ft. level. Copper Range, which recently touched $60, fell back to $50 in anticipation of a reduction in the dividend. The rate has been cut from a $3 to $2 per annum basis by the declaration of

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company	Sept.	October	Nov.
Alaska shipments	2,807,240	.....	.....
Anaconda	21,565,800	21,400,000	20,850,000
Arizona, Ltd	2,544,000	2,720,000	.....
Balaklala	.....	.....	.....
Copper Queen	6,546,540	7,786,218	6,946,775
Calumet & Ariz	4,198,000	4,784,000	4,390,000
Detroit	1,864,050	2,086,624	1,941,498
East Butte	1,134,000	920,000	1,025,000
Mammoth	1,751,327	1,865,846	.....
Nevada Con	5,328,983	5,547,931	.....
Old Dominion	2,032,000	.....	.....
Shannon	1,550,080	1,124,000	.....
South Utah	266,000	.....	.....
United Verde*	2,750,000	2,750,000	.....
Utah Copper Co	9,285,381	8,660,729	.....
Lake Superior*	18,500,000	18,440,000	.....
Non-rep. mines*	14,748,673	15,634,000	.....
Total production	96,872,674	.....	.....
Imports, bars, etc.	26,679,736	22,960,027	.....
Total blister	123,552,410	.....	.....
Imp. in ore & matte	6,408,799	4,137,431	.....
Total	129,961,209	.....	.....
Brit. Col. Cos.:			
British Col. Copper	875,023	778,586	.....
Granby	.....	.....	.....
Mexican Cos.:			
Boleo	2,094,400	1,245,440	.....
Cananea	.....	5,804,000	.....
Moctezuma	2,112,683	1,719,643	1,682,768
Other Foreign:			
Cape Cop., S. Africa	.....	.....	.....
Spassky, Russia	759,360	.....	.....
Exports from:			
Chile	4,816,000	4,816,000	.....
Australia	6,496,000	7,056,000	.....

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER

Month	United States Product'n.	Deliveries, Domestic.	Deliveries for Export
XI, 1910	119,353,463	60,801,992	67,424,316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127
IV	118,085,223	52,407,650	62,129,599
V	126,962,544	64,543,963	61,978,557
VI	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,936,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	.....	.....	.....

	Visible Stocks.		
	United States.	Europe.	Total.
XII, 1910	130,389,069	193,200,000	323,589,095
I, 1911	122,030,195	236,629,120	358,649,373
II	142,439,490	236,992,000	379,431,134
III	156,637,770	233,385,600	390,023,009
IV	162,007,934	223,014,400	385,022,434
V	165,555,908	212,284,800	377,840,708
VI	165,995,932	202,540,800	368,536,732
VII	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698
IX	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	.....	164,281,600	.....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

50c. quarterly. In a year's time the dividend has been cut in half.

Curb trading has been of fair volume and with fairly steady prices. Butte Central touched $5.37½. The new Pond Creek stock is selling at $15.50@15.87½ per share.

Assessments

Company	Delinq	Sale	Amt
Arizona Commercial, Ariz.	Dec. 11	.....	$1.00
Best & Belcher, Nev.	Dec. 6	Dec. 29	0.05
Caledonia, Nev.	Dec. 11	Jan. 2	0.10
Challenge, Nev.	Nov. 21	Dec. 12	0.05
Con. Virginia, Nev.	Dec. 16	Jan. 6	0.25
Corbin Copper, Mont.	Dec. 11	.....	1.00
Eureka-Swansea Ex., Utah.	Dec. 14	.....	0.01
Giant, Nev.	Nov. 15	Dec. 15	0.006
Julia, Nev.	Dec. 28	Jan. 16	0.05
Kinsley Development, Utah	Nov. 20	Dec. 11	0.C02
Ojibway, Mich.	Jan. 10	.....	1.00
Overman, Nev.	Dec. 13	Jan. 3	0.05
Pioche Metals, Utah.	Nov. 20	Dec. 11	0.005
Rainbow, Utah.	Dec. 1	Dec. 20	0.002½
Raven, Mont.	Feb. 1	.....	0.10
San Antonia, Mex.	Nov. 20	.....	0.50
Savage, Nev.	Nov. 23	Dec. 14	0.10
Scorpion, Nev.	Dec. 12	Jan. 3	0.02
Smuggler, Utah.	Jan. 10	Jan. 10	0.002½
Sparrow Hill, Cal.	Dec. 16	Jan. 8	.0008½
Superior & Boston, Ariz.	Oct. 16	.....	0.50
Swansea, Utah.	Nov. 13	.....	0.01
Union Con., Nev.	Nov. 27	Dec. 19	0.15
Utah Con. M. & M., Utah.	Dec. 20	.....	0.002½
Utah Con. Tintic, Utah.	Dec. 7	.....	0.01
Victoria, Mich.	Aug. 21	.....	1.00
Winona, Mich.	Nov. 10	.....	1.00
Wyandot, Mich.	Dec. 14	.....	1.00

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454	52.745	23.227	23.690	24.324
April	51.428	53.221	53.325	23.708	24.483	24.595
May	52.905	53.870	53.308	24.343	24.797	24.583
June	52.538	53.462	53.043	24.166	24.651	24.486
July	51.043	54.150	52.630	23.519	25.034	24.286
August	51.125	52.912	52.171	23.588	24.428	24.082
September	51.440	53.295	52.440	23.743	24.567	24.209
October	50.923	55.490	53.340	23.502	25.596	24.594
November	50.703	55.635	55.719	23.351	25.680	25.649
December	52.226	54.428	.....	24.030	25.160	.....
Total	51.502	53.486	.....	23.706	24.670	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54.704
April	12.733	12.019	13.091	12.275	57.238	54.035
May	12.550	11.989	12.885	12.214	56.313	54.313
June	12.404	12.385	12.798	12.611	55.310	56.368
July	12.215	12.463	12.570	12.720	54.194	56.670
August	12.490	12.405	12.715	12.634	55.733	56.264
September	12.379	12.201	12.668	12.508	55.207	55.253
October	12.553	12.189	12.788	12.370	56.722	55.176
November	12.742	12.616	12.914	12.769	57.634	57.253
December	12.581	.....	12.863	.....	56.769	.....
Year	12.738	.....	13.039	.....	57.054	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1910.	1911.	Month	1910.	1911.
January	32.700	41.255	July	32.695	42 400
February	32.920	41 614	August	33.972	43 319
March	32.403	40.157	September	34.982	39 755
April	32.976	42 185	October	36.190	41.185
May	33.125	43.115	November	36.547	43.125
June	32.769	44.606	December	38.199	.....
			Av. Year	34.123	.....

Prices are in cents per pound.

LEAD

Mohth	New York		St. Louis		London	
	1910.	1911.	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	4.412	4.225	4.262	12.641	12.889
May	4.315	4.373	4.164	4.223	12.550	12.984
June	4.343	4.435	4.207	4.292	12.688	13.260
July	4.404	4.499	4.291	4.397	12.531	13.530
August	4.400	4.500	4.290	4.406	12.513	14.260
September	4.400	4.485	4.289	4.356	12.582	14.744
October	4.400	4.265	4.271	4.139	13.091	15.332
November	4.442	4.298	4.314	4.181	13.217	15.821
December	4.500	.....	4.363	.....	13.197	.....
Year	4.446	.....	4.312	.....	12.920	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	5.399	5.289	5.249	22.469	23.743
May	5.191	5.348	5.041	5.198	22.100	24.375
June	5.128	5.520	4.978	5.370	22.094	24.612
July	5.152	5.695	5.002	5.545	22.406	25.006
August	5.279	5.953	5.129	5.803	22.800	26 801
September	5.514	5 869	5.364	5 719	23.165	27.750
October	5.628	6.102	5.478	5.951	23.900	27.256
November	5.976	6.380	5.826	6.223	24.083	26.795
December	5.624	.....	5.474	.....	24.019	.....
Year	5.520	.....	5.370	.....	23 050	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1910	1911	1910	1911	1910	1911
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53	15.90	16.93	14.65	17.00	14.96
April	18.28	15.90	16.84	14.65	16.75	15.00
May	17.10	15.90	15.94	14.30	16.18	14.72
June	16.52	15.90	15.60	14.06	15.53	14.56
July	16.40	15.90	15.40	14.03	15.40	14.53
August	16.09	15.90	14.89	14.00	15.16	14.47
September	15.92	15 90	14.73	13.57	14.93	14.40
October	15.90	15.43	14.05	13.44	14.88	14.34
November	15 84	14.92	14.26	13.30	14.78	14.25
December	15.90	.....	14.15	.....	14.65	.....
Year	$17.10	.....	$15.65	.....	$15.83	.....

STOCK QUOTATIONS

COLO. SPRINGS Dec. 5

Name of Comp.	Bid.
Acacia	.04
Cripple Cr'k Con.	.02
C. K. & N.	.14
Doctor Jack Pot.	.06⅞
Elkton Con.	.71½
El Paso	.67
Findlay	.05
Gold Dollar	.16½
Gold Sovereign	.02
Isabella	.12½
Jack Pot	.06
Jennie Sample	.06
Lexington	.01
Moon Anchor	.02
Old Gold	.03½
Mary McKinney	.47
Pharmacist	.02½
Portland	.94
Vindicator	.67½
Work	.02½

SALT LAKE Dec. 5

Name of Comp.	Bid.
Beck Tunnel	.17
Black Jack	.11
Carisa	.17
Cedar Talisman	.02½
Colorado Mining	.31
Columbus Con.	.10
Daly Judge	‡4.12½
Grand Central	.82
Iron Blossom	1.02⅝
Little Bell	‡.35
Lower Mammoth	.02½
Mason Valley	9.50
May Day	.11
Nevada Hills	2.45
New York	‡.05¾
Prince Con	.81
Silver King Coal'n	1.60
Sioux Con.	.12
Uncle Sam	.24½
Yankee	‡ 13

TORONTO Dec. 5

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	6.00	Pearl Lake	.40
Hudson Bay	80.00	Porcu. Gold	.57
Temiskaming	.26	Porcu. Tisdale	.05
Wettlaufer-Lor.	.84	Preston E. D.	.17
Apex	.10½	West Dome	.90
Central	3.50	Standard	.13
Dobie	.90	Foley O'Brien	.47
Dome Exten.	.65	Rea	2.98
Hollinger	11.25	Crown Chartered	.54
Imperial	.08	Swastika	.26½

SAN FRANCISCO Dec. 5

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.02	Belmont	8.10
Belcher	.45	Jim Butler	.27
Best & Belcher	.17	MacNamara	.26
Caledonia	1.00	Midway	.24
Challenge Con.	.18	Mont.-Tonopah	.88
Chollar	.10	North Star	.27
Confidence	.55	West End Con.	.69
Con. Virginia	.65	Atlanta	.15
Crown Point	.75	Booth	.06
Gould & Curry	.09	C.O.D. Con.	.14
Hale & Norcross	.20	Comb. Frac.	.15
Mexican	4.07½	Jumbo Extension	.23
Occidental	.50	Pitts.-Silver Peak	1.22½
Ophir	1.72½	Silver Pick	.07
Overman	.85	St. Ives	.35
Potosi	.13	Tramps Con.	.02
Savage	.34	Argonaut	3.40
Sierra Nevada	.42	Bunker Hill	‡3.00
Union Con.	1.45	Cent. Eureka	.39
Yellow Jacket	.55	So. Eureka	‡6 00

N. Y. EXCH. Dec. 5

Name of Comp.	Clg.
Amalgamated	62
Am. Agri. Chem.	55
Am.Sm.&Ref.,com	72⅛
Am. Sm.& Ref., pf.	103⅛
Am. Sm. Sec., pf. B	85⅝
Anaconda	37½
Batopilas Min.	1⅜
BethlehemSteelpf	55⅝
Chino	23⅛
Federal M.& S., pf.	45
Goldfield Con.	4⅛
Great Nor., ore ctf.	42
Homestake	86½
Miami Copper	22⅞
Nat'nalLead,com.	50⅛
National Lead, pf.	105
Nev. Consol	18⅛
Pittsburg Coal, pf.	83
Ray Con.	15⅝
RepublicI&S,com	23¼
Republic I & S, pf.	83
SlossSheffi'd,com.	41
Sloss Sheffield, pf.	110
Tennessee Copper	37
Utah Copper	50⅜
U. S. Steel, com.	63
U. S. Steel, pf.	109⅜
Va. Car. Chem.	53⅝

N. Y. CURB Dec. 5

Name of Comp.	Clg.
Barnes King	‡1⅛
Beaver Con.	.41
Braden Copper	5⅛
B. C. Copper	4⅜
Buffalo Mines	1.40
Butte & Vipond	.53
Butte Coalition	17
Cobalt Central	.01
Con. Ariz Sm.	1/16
Davis-Daly	⅞
Diam'field-Daisy	14
Ely Con	3/16
Florence	.50
Giroux	4⅛
Gold Hill Con.	1/16
Greene Cananea	7⅞
Greenwater	.05
Guggen. Exp.	170
Inspiration	9⅜
Internat. S. & R.	‡124
Kerr Lake	2¾
La Rose	3⅞
McKinley-Dar-Sa.	1⅜
Min. Co. of A. new	4
Nev. Utah M. & S.	3/16
Nipissing Mines	7⅝
Ohio Copper	1⅝
Pacific Sm. & M.	⅛
Porcupine T'nsite	.55
Precious Metals	‡1¾
Ray Central	1 1/16
Red Warrior	‡1⅛
South Utah M. & S.	‡1 1/16
Standard Oil (Old)	625
Stand'd Oil of N.J.	340
Stand'd Oil Subs.	325
Stewart	‡.69
Tonopah	7
Tonopah Ex.	1⅜
Tri-Bullion	⅛
Tularosa	‡⅜
Yukon Gold	3⅛

LONDON Dec. 6

Name of Com	Clg.
Camp Bird	£1 11s 3d
Dolores	1 10 0
El Oro	1 3 0
Esperanza	1 10 3
Mexico Mines	7 13 9
Oroville	0 5 6
Stratton'sInd.	0 2 0
Tomboy	1 4 0

BOSTON EXCH. Dec. 5

Name of Comp.	Clg.
Adventure	4¼
Algomah	3¾
Allouez	35
Am. Zinc	25⅛
Arizona Com.	¼
Bonanza	.35
Boston & Corbin	6¾
Butte & Balak	3¾
Calumet & Ariz.	56¾
Calumet & Hecla	400
Centennial	11⅝
Con. Mercur	‡.03
Copper Range	51⅞
Daly-West	5¼
East Butte	11½
Franklin	8⅛
Granby	29⅛
Hancock	28
Hedley Gold	14⅜
Helvetia	1⅛
Indiana	11½
Island Cr'k, com.	41½
Isle Royale	19¾
Keweenaw	.80
Lake	33½
La Salle	5⅝
Live Oak	36
Mass	7
Michigan	2
Mohawk	46
New Arcadian	3
New Idria Quick.	7⅝
North Butte	25¼
North Lake	6½
Ojibway	4
Old Dominion	47
Osceola	98
Parrot	9⅜
Quincy	66
Shannon	9¼
Shattuck-Ariz.	17¾
Superior	26
Superior & Bost.	3¼
Tamarack	26
Trinity	4
Tuolumne	3½
U. S. Smelting	35
U. S. Smelt'g, pf.	47¾
Utah Apex	2⅛
Utah Con.	16½
Victoria	2⅝
Winona	5⅝
Wolverine	88
Wyandot	.30

BOSTON CURB Dec. 5

Name of Comp.	Last
Ahmeek	205
Bingham Mines	1½
Boston Ely	.90
Boswyocolo	.11
Cactus	.23
Calaveras	1
Chief Cons	.66
Corbin	1½
Cortez	1⅝
Crown Reserve	2⅞
First Nat. Cop.	1⅞
Majestic	.36
Mazatan	.30
Moneta Porc.	.10
Nat'l Mine & Ex.	.08
Nevada-Douglas	3
New Baltic	4
Oneco	1⅞
Raven Copper	.21
Rhode Island Coal	1⅞
San Antonio	‡3½
South Lake	5½
Trethewey	.60
Union Mines	‡½
United Verde Ext.	.93
Vulture	‡5

‡Last quotation.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES

ABRASIVES—		
Carbons, good drill quality, carat		$50.00@75.00
Carborundum, f.o.b. Niagara Falls, powd.	lb.	.08
Grains	"	.10@.17
Corundum	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05½@.06
Emery, in kegs; Turkish flour	"	.01½@.02
Grains	"	.03½@.04
Naxos flour	"	.01½@.02
Grains	"	.03½@.04
Chester flour	"	.01½@.02
Grains	"	.03½@.04
Peekskill flour, f.o.b. Easton, Pa	"	.01½@.01¾
Grains, in kegs	"	.02½@.03
Garnet, per quality	sh. ton	25.00@35.00
Pumice Stone, Am. Powd., 100 lb.		1.60@2.00
Italian, powdered, per lb		.01½@.01¾
Lump, per quality	"	.03@.30
Rottenstone, ground	"	.02@.04
Lump, per quality	"	.05@.20
Rouge, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07@.07½
ACIDS—		
Acetic 28%	lb.	.0175@.0190
Boric	"	.07
Hydrofluoric, 30%	"	.02½@.03½
" 48%	"	.06
" 52%	"	.06½
" 60%	"	.10
Hydrochloric acid, 20° per 100 lb.		1.25@1.50
Nitric acid, 36° to 40°	per lb.	.03½@.04½
Sulphuric acid, 50°, bulk per ton.		$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.25
66°, bulk, ton		18.00
Oxalic	per lb.	.07½@.072
ALCOHOL—Grain 95%	gal.	2.60
Denatured	"	.42
Refined wood, 95@97%	"	.52@.57
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	"	.04½@.05
ALUMINUM—Sulphate, com'l.	lb.	.90@1.50
AMMONIA—24 deg	"	.04½@.05½
" 26 deg	"	.04½@.05½
AMMONIUM—		
Bromide	lb.	.36
Carbonate	"	.08@.08½
Muriate gran	"	.05½@.06
Lump	"	.09½@.09½
Sulphate, 100 lb	"	3.10@3.15
Sulpho-cyanide com	"	.25
" " chem. pure	"	.35
ANTIMONY—needle, powder	lb.	.04½@.04¾
Oxide	"	.08½@.10
ARSENIC—white	"	.02¾@.02¾
Red, Outside brands	"	.05½@.06½
Saxony	"	.06½@.06¾
ASPHALTUM—		
Barbadoes	per ton	100.00@170.00
West Indies	"	30.00@60.00
Egyptian	lb.	.30@.40
Gilsonite, Utah ordinary	per ton	36.00@50.00
Trinidad	"	25.00@30.00
California	per ton	22.50@30.00
BARIUM—		
Carb. Lump, 80@90%	lg. ton	26.00@35.00
Precipitated, 96@98%	"	31.00@33.00
Powdered, natural	lb.	.02@.02½
Chloride com'l	ton	32.50@37.50
Nitrate powdered, in casks	lb.	.05½@.06½
Blanc Fixe, dry, bbl.	per lb.	.02½@.04
BARYTES—		
Am. Ground	sh. ton	12.00@13.00
Floated	"	16.00@17.00
Foreign floated	"	18.00@22.50
BLEACHING POWDER—35% 100 lb		1.17½@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.		4.50@4.75
BONE ASH	lb.	.02½@.04
BORAX, sacks	"	.03½@.04
CALCIUM—Acetate, gray, 100 lb.		1.87½@2.00
Carbide, ton lots f.o.b. Niagara Falls, N. Y.	sh. ton	70.00
Chloride, f.o.b. N. Y.	"	8.25@10.00
CEMENT—Slag cement	bbl.	0.75@1.25
Portland, Am. 400 lb	"	1.20@1.30
Foreign	"	2.25@2.90
"Rosendale," 300 lb. (in sacks)	"	.85 .65
CHROME ORE—		
New Caledonia 50% ex. ship N. Y.	per lg. ton	14.00@16.00
Bricks, f.o.b. Pittsburg, per M.		175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	ton	8.00@9.00
Foreign	"	11.50@18.00
COBALT—Oxide	lb.	.78@.80
COPPERAS—Bulk	100 lb.	$0.55
In bbls	"	.65@.85
In bags	"	.60@.80
CRYOLITE (carload)	lb.	.05¼
FELDSPAR—Ground	sh. ton	8.00@12.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis	"	16.00
Extra	"	20.00@23.00
Special extra	"	30.00@35.00
FIRE CLAY—f.o.b. St. Louis.		
St. Louis, extra quality	per ton	5.00
ordinary	"	2.50
FLUORSPAR—		
Domestic f.o.b. Pittsburg: Lump	ton	8.00@10.00
Ground	"	12.00@14.00
Foreign crude ex. dock	"	8.50
FULLER'S EARTH—Lump, 100 lb.		.80@.85
Powdered	"	.80@.85
GRAPHITE—Ceylon.		
Flying dust, finest to best	lb.	.01@.02
Dust	"	.02@.04
Chip	"	.03@.06
Lump	"	.04@.09
Large lump	"	.04@.08
GYPSUM—		
Fertilizer	sh. ton	5.00
Ground	"	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. Best	lb	.01½@.02½
German	"	.02½@.02¾
LEAD—		
Acetate (sugar of)	lb.	.07¾@.09¾
Nitrate, com'l	"	.07½@.08¼
MAGNESITE—Greece.		
Crude (95%)	lg. ton	7.50@8.50
Calcined, powdered	sh. ton	26.00@35.00
Brick, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.90@1.25
Sulphate (Epsom salt)	100 lb.	1.00@1.10
MANGANESE—		
Foreign, crude, powdered: 70@75% binoxide	lb.	.006@.01
75@85% binoxide	"	.011@.015
85@90% binoxide	"	.01½@.04
90@95% binoxide	"	.03½@.08½
Ore, 80%-85%	sh. ton	12.00@25.00
MARBLE—Flour	sh. ton	9.00@9.50
MINERAL WOOL—		
Slag, ordinary	sh. ton	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, normal	lb.	.08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.40@.45
Sulphate, single	lb.	.10½@.11
Sulphate, double	"	.05½@.08
NITRATE OF SODA—		
100 lb. 95% (spot)		2.20
95% (future, 1911)		2.20
96% is 2½@7½c. higher per 100 lb.		
OZOKERITE—best	lb.	.15½
PAINTS AND COLORS—		
Litharge, Am. powdered	lb.	.07½@.07¾
English glassmakers'	"	.08¼@.09¼
Lithophone	"	.03½@.04
Metallic, brown	sh. ton	18.00@20.00
Red	"	25.00@30.00
Ocher, Am. common	"	12.00@15.00
Best	"	15.00@20.00
Dutch, washed	lb.	.02½@.03½
French, washed	"	.01½@.02
Paris green, pure, bulk	"	.13@.18
Red lead, American	"	.06½@.07
Foreign	"	.08½@.09
Turpentine, spirits bbl., per gal.		.50@.50½
White lead, Am., dry	lb.	.05½@.06
American, in oil	"	.07½@.07¾
Foreign, in oil	"	.09¾@.10
Zinc white. Am. extra dry	"	.05¼@.06½
French proc's, red seal, dry	"	.08¾
French process, green seal, dry	"	.10¾
PHOSPHATES—Acid		60@62c. per unit
*Fla., hard rock 77%		5.75@6.25
land pebble 68%		3.70@3.80
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@3.75

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—		
Bicarbonate crystal	lb.	$.07½@.08
Powdered or granulated	"	.08@.08½
Bichromate	"	.07½@.07¾
Bromide	"	.28
Carbonate (80@85%)	"	.03½@.04
Caustic, ordinary	"	.03½@.05½
Elect. (90% KOH)	"	.05½@.05½
Chloride (muriate), 100 lb		1.90
Chlorate, powdered	"	.08½@.09½
Crystals	"	.08½@.09½
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots		18½c.
Less than 5 tons		.19
Kainite, long ton, bulk, 7.50; bags,		8.50
Permanganate	lb.	.09½@.10½
Prussiate, yellow	"	.13@.13½
Red	"	.26@.30
Sulphate (basis 90%)	100 lb.	2.18@2.21
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. R. R. per unit		.12@.12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines		.10@.12
Imported, non-arsenical, furnace size, ex-ship, per unit		.13@.13½
Imported, arsenical, furnace size, ex-ship, per unit		.12½@.12¾
Imported fines, arsenical, ex-ship		.12
Imported fines, non-arsenical, ex-ship, per unit		.12½

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.

SALT—N. Y. com. fine 280 lb.	bbl.	1.05@1.15
N. Y. agricultural	sh. ton	2.90@3.50
SALTPETER—Crude	100 lb.	4.00@4.50
Refined, crystals		5.00@5.75
SILICA—		
Ground quartz, ord'ry	lg. ton	7.00@15.00
Silex, ground	"	7.00@15.00
Silex, floated	"	30.00@40.00
Lump quartz	"	5.00@5.50
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.345@.355
SODIUM—Acetate	lb.	.04½@.05
"Alkali," per 100 lb., 58@48		.90@.95
Bicarb. soda, per 100 lb		1.00@1.30
Soda, caustic, per 100 lb., 78@60		1.70@1.80
Soda, caustic, powdered		.02½@.03
Salt cake, per 100 lb., bulk		.50@.62½
Salt Cake, bbl.		.65@.85
Soda, monohydrate, per lb.		1.30@1.75
Bichromate	lb.	.05@.05½
Bromide	"	.20
Chlorate, com'l	"	.08½@.09½
Cyanide, 120-130% KCN, per 100%		
Carloads (30,000 lb.)	lb.	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	.20
Hyposulphite, Am.	"	1.30@1.50
Phosphate	100 lb.	2.10@2.40
Prussiate	"	.08@.08½
Sal soda, f.o.b. N. Y.	"	.60@.75
Foreign, f.o.b. N. Y.	"	.80@1.00
Silicate, com'l	"	.65@1.00
Sulphate, com'l (Glauber's salt)	100 lb.	.60@.80
Sulphate, com'l, calcined		.65@.85
STRONTIUM—Nitrate	lb.	.07@.08
SULPHUR—Louisiana (prime) to New York	lg. ton	22.00 up
To Boston, Philadelphia or Baltimore	"	22.50 up
Roll	100 lb.	1.85@2.15
Flour	100 lb.	2.00@2.40
Flowers, sublimed	100 lb.	2.20@2.60
Powdered commercial, bags		1.50
Sicilian, extra qual., unmixed seconds, crude brimstone to New York	lg. ton	$22.50
TERRA ALBA—Fr. & Eng.	100 lb.	.75@.90
TALC—Domestic	sh. ton	12.00@25.00
French	"	15.00@25.00
Austrian	"	35.00
Italian, best	"	33.00
TIN—Bi-chloride, 50°	lb.	.13
Crystals	"	.28½@.31
Oxide	"	.49
URANIUM—Oxide	"	2.20@4.25
ZINC—Chloride sol., com. 20	lb.	.02¼
Chloride, granular	"	.04½@.04½
Dust	"	.07@.07½
Sulphate	"	.02½@.02½

NOTE.—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output on private contract.